BBOB 2010: Comparison Tables of All Algorithms on All Noisy Functions

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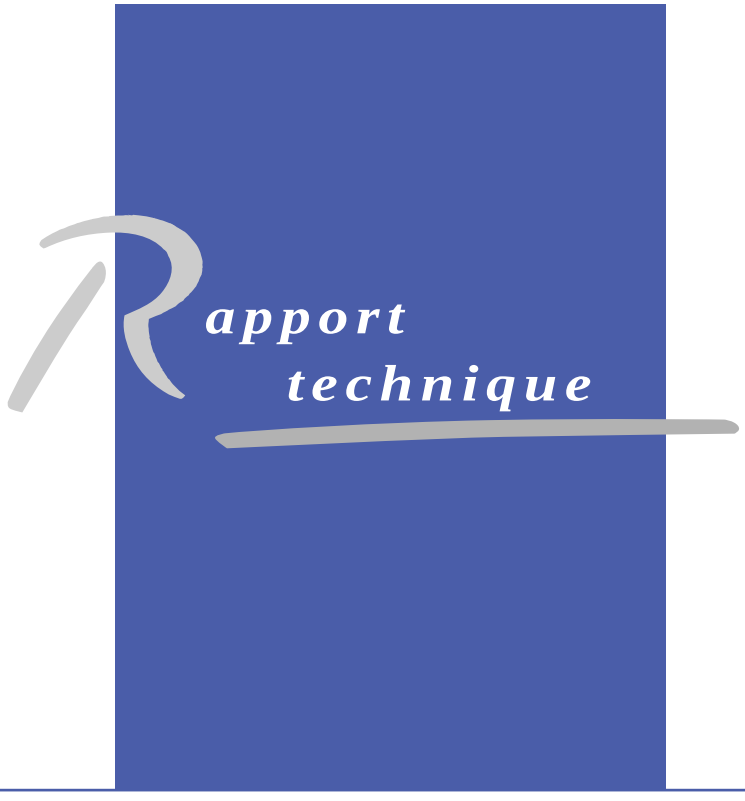
Domaine 1



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BBOB 2010: Comparison Tables of All Algorithms on All Noisy Functions

Anne Auger , Steffen Finck , Nikolaus Hansen , Raymond Ros

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Abstract: This document presents the results from the BBOB Black-Box Optimization Benchmarking workshop of the GECCO Genetic and Evolutionary Computation Conference 2010 in tables. Each table presents the performance of each algorithm submitted to BBOB 2010 on one function and dimension from the noisy testbed.

Key-words: continuous optimization, benchmarking

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BBOB 2010: Tables de comparaison de tous les algorithmes sur toutes les fonctions bruitées

Résumé : Ce document présente les résultats sous forme de table du workshop Black-Box Optimization Benchmarking (BBOB) de la conférence Genetic and Evolutionary Computation Conference (GECCO), Portland, Oregon, Etats-Unis, 2010. Chaque table présente les performances des algorithmes soumis à BBOB 2010 pour un problème de la suite de fonctions tests bruitées.

Mots-clés : optimisation continue, banc d'essai

This document provides tabular results of the workshop for Black-Box Optimization Benchmarking at GECCO 2010[1]. Many algorithms have been tested on 30 noisy benchmark functions in dimensions between 2 and 40. A description of the used objective functions can be found in [11, 7]. The experimental set-up is described in [10].

The performance measure provided in the following tables is the expected number of objective function evaluations to reach a given target function value (ERT, expected running time), divided by the respective value for the best algorithm in BBOB-2009 (see [6]) if an algorithm from BBOB-2009 reached the given target function value. The ERT value is given otherwise ($\mathrm{ERT}_{\mathrm{best}}$ is noted as infinite). If the target was never reached, the median over all trials of the best function value is shown. See [10] for details on how ERT is obtained. Bold entries in the table correspond to values below 3 or the top-three best values.

List of Tables

[1] see http://coco.gforge.inria.fr/doku.php?id=bbob-2010

Table 1: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{101} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.90	4.0	5.0	5.6	7.2	8.4	10	11	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	3.8	**2.5**	4.2	6.6	8.1	9.5	10	12	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	3.8	**2.4**	4.8	7.4	8.3	8.7	11	12	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**2.4**	**1.4**	4.3	7.0	7.3	7.9	8.9	11	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	4.6	3.2	6.5	8.5	14	13	14	15	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	5.0	**2.5**	5.0	7.0	7.0	7.7	7.9	9.1	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	3.2	**1.7**	3.3	5.4	6.3	6.6	7.2	8.4	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	3.2	**1.6**	**2.9**	**4.1**	**4.8**	**5.2**	**5.3**	**6.2**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	4.6	**2.5**	3.3	5.2	5.5	6.4	6.0	7.3	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	3.2	**1.7**	**2.1**	**2.3**	**2.0**	**1.9**	**1.7**	**1.6**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	10	13	14	9.3	13	19	40	49	92	2502	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	5.2	**2.5**	3.8	7.7	8.1	8.9	10	12	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	3.6	3.2	5.8	7.5	8.5	9.2	11	12	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.3**	3.1	10	22	30	35	38	46	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.4**	**1.8**	**2.1**	**2.3**	**2.5**	**2.3**	**2.0**	**1.9**	NEWUOA [16]
Basic RCGA	**1**	**1**	**2.3**	3.2	32	62	67	86	111	192	Basic RCGA [17]
SPSA	24	41	173	159	282	907	764	687	631	641	SPSA [9]

Table 2: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{102} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.90	3.5	5.4	8.3	10	11	12	16	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	5.6	3.2	5.2	5.7	6.6	8.6	9.3	10	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	3.3	**2.7**	**3.1**	4.7	6.7	7.1	7.6	8.7	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	3.2	**2.2**	4.1	5.1	6.2	6.9	8.0	8.7	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	3.1	**2.8**	4.0	5.0	7.5	7.6	10	12	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	4.0	**2.7**	3.9	**4.1**	5.1	5.4	5.5	6.6	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	4.0	**2.3**	3.2	4.2	4.8	5.6	6.0	6.6	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	3.1	**2.5**	**2.6**	**3.0**	**3.7**	**3.8**	**4.3**	**4.7**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	3.3	**2.3**	3.2	**3.0**	**3.9**	**4.1**	**4.5**	5.0	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.2**	4.0	**2.1**	**2.6**	4.4	**4.1**	**3.7**	**3.4**	**2.8**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	13	16	16	7.1	39	36	47	45	705	3827	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	4.1	3.5	5.9	5.8	7.0	7.9	8.2	9.1	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**2.8**	3.4	5.6	5.2	5.9	7.4	8.0	8.4	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.3**	4.3	11	17	25	26	32	34	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	7.1	11	9.3	7.0	6.6	5.8	5.2	**4.4**	NEWUOA [16]
Basic RCGA	**1**	**1**	**2.0**	3.3	24	47	56	75	103	146	Basic RCGA [17]
SPSA	9.1	16	27	239	265	255	254	873	870	4083	SPSA [9]

Table 3: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{103} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.90	3.9	4.7	4.7	4.7	4.9	4.9	6.8	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	3.4	3.3	5.3	9.3	13	17	22	23	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	3.0	**1.9**	4.0	8.0	13	16	19	21	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**2.5**	**2.0**	4.2	8.0	12	15	19	20	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	3.0	3.2	7.3	10	13	16	21	23	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	4.0	**2.1**	4.4	6.4	9.3	12	15	16	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**2.8**	**1.5**	3.6	6.2	9.1	11	14	14	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**2.4**	**1.6**	**2.6**	**4.8**	**7.0**	**8.4**	**11**	**11**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	4.3	**2.3**	3.5	5.4	8.1	10	13	13	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	3.1	**1.8**	**2.1**	**3.0**	**4.1**	**4.4**	**7.1**	**6.9**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	12	19	19	6.9	12	19	35	75	82	189	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	3.2	**2.4**	4.4	8.2	12	16	21	21	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	4.0	3.3	5.7	8.5	14	17	22	23	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.4**	**2.6**	13	30	51	63	83	94	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	3.2	**1.6**	**2.1**	**3.1**	**4.2**	**4.9**	**6.4**	**7.8**	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.6**	3.9	22	52	110	167	268	423	Basic RCGA [17]
SPSA	22	38	369	195	256	375	1471	4060	11338	12346	SPSA [9]

Table 4: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{104} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.60	2.0	2.7	7.3	97	120	124	126	128	132	ERT_{best}/D
(1,2)-CMA-ES	4.3	4.2	7.5	28	9.3	16	19	20	20	29	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.5**	4.0	5.8	22	4.9	8.6	10	10	10	11	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3.2	**1.9**	4.8	14	4.4	8.5	11	12	12	13	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	11	4.8	9.2	37	11	22	29	57	58	74	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	4.2	3.6	6.6	13	**2.8**	**2.8**	3.0	3.2	3.3	3.4	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	4.6	3.2	5.6	18	**2.3**	**2.5**	**2.6**	**2.7**	**2.9**	**3.0**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.6**	**1.3**	**2.9**	**7.5**	**1.7**	**1.8**	**2.0**	**2.1**	**2.1**	**2.3**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.8**	**1.7**	**3.6**	12	**2.9**	3.8	3.9	4.0	4.0	4.1	(1,4s)-CMA-ES [3]
avg NEWUOA	5.2	**2.8**	4.3	**7.8**	**1.2**	3.5	5.3	6.4	6.8	8.7	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	45	18	20	19	26	72	199	197	305	392	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.8**	**2.2**	**3.5**	**5.8**	**1.2**	**1.8**	**2.1**	**2.3**	**2.4**	**2.7**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	5.3	3.2	5.1	15	**2.7**	3.2	3.9	4.1	4.4	4.6	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.8**	**2.3**	6.6	11	3.1	4.3	5.1	5.8	6.5	7.5	CMA+DE-MOS [13]
NEWUOA	7.3	**2.9**	6.4	13	3.4	6.5	10	13	12	13	NEWUOA [16]
Basic RCGA	3.2	**2.0**	7.7	19	34	89	245	514	1709	*10e-5/5e4*	Basic RCGA [17]
SPSA	611	294	840	1711	4319	*39e-2/1e5*	.	.	.	.	SPSA [9]

Table 5: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{105} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.60	2.0	2.7	7.4	178	186	190	195	198	205	ERT_{best}/D
(1,2)-CMA-ES	5.8	4.7	7.3	35	9.3	18	32	54	68	66	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	4.8	3.4	12	17	**2.3**	8.4	17	35	36	38	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**2.4**	**1.8**	**4.3**	**8.3**	3.3	13	22	32	41	40	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	4.7	3.3	12	36	4.4	16	42	119	121	156	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	4.4	4.0	5.6	35	**2.9**	4.9	6.4	6.4	6.3	6.3	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.7**	**2.4**	**4.1**	23	**1.8**	**3.6**	**4.0**	**4.3**	**4.3**	**4.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	5.4	**2.8**	5.6	17	**2.6**	4.5	5.4	5.9	6.8	6.7	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	3.3	5.8	**5.2**	24	3.1	6.2	7.3	7.8	7.8	7.7	(1,4s)-CMA-ES [3]
avg NEWUOA	6.4	3.7	7.0	13	**2.3**	8.6	29	55	196	388	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	50	21	18	17	41	238	959	2211	3364	6907	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	8.3	3.1	6.6	**8.3**	**1.0**	**1.5**	**1.9**	**2.0**	**2.0**	**2.2**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	6.5	3.7	5.5	16	**2.3**	5.4	5.7	5.8	5.9	6.1	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.6**	**2.3**	6.2	**7.4**	**1.6**	**2.9**	**3.4**	**3.7**	**4.0**	**4.7**	CMA+DE-MOS [13]
NEWUOA	6.3	**2.7**	7.9	16	3.1	6.3	22	42	41	115	NEWUOA [16]
Basic RCGA	3.3	3.9	8.1	11	13	50	165	465	1153	*18e-5/5e4*	Basic RCGA [17]
SPSA	519	302	320	1513	1483	8005	*34e-2/1e5*	.	.	.	SPSA [9]

Table 6: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{106} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.60	2.0	2.7	7.6	70	140	176	206	245	325	ERT_{best}/D
(1,2)-CMA-ES	8.0	7.2	28	53	13	9.3	8.4	7.5	6.5	5.1	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	5.1	4.8	6.8	12	4.8	3.8	3.8	3.6	3.3	**2.7**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3.8	3.2	5.4	**3.9**	4.8	3.1	3.2	**3.0**	**2.6**	**2.1**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	4.8	3.3	3.9	84	30	21	18	20	18	16	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	5.4	3.2	6.1	11	**2.7**	**1.7**	**1.6**	**1.4**	**1.3**	**1.1**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.8**	**1.7**	4.2	6.3	**2.0**	**1.4**	**1.3**	**1.3**	**1.1**	**0.97**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	4.7	3.0	**3.0**	**2.8**	**1.3**	**1.1**	**1.0**	**1.0**	**0.91**	**0.76**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.8**	**1.7**	**2.6**	10	**2.9**	**1.8**	**1.7**	**1.5**	**1.3**	**1.1**	(1,4s)-CMA-ES [3]
avg NEWUOA	4.6	**2.2**	3.7	**4.5**	**2.1**	**2.1**	3.2	3.3	4.3	5.9	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	54	36	96	91	15	10	8.7	7.7	35	30	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.4	3.5	8.3	7.7	**2.1**	**1.7**	**1.5**	**1.5**	**1.4**	**1.2**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	3.1	**2.2**	3.9	9.2	3.4	**2.6**	**2.6**	**2.5**	**2.3**	**2.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.6**	**2.2**	6.1	13	3.9	3.6	3.7	3.5	3.6	3.3	CMA+DE-MOS [13]
NEWUOA	3.1	**2.1**	**2.6**	6.1	**2.0**	**2.3**	3.2	3.2	4.8	5.7	NEWUOA [16]
Basic RCGA	**2.4**	3.2	6.8	12	18	103	308	384	658	2206	Basic RCGA [17]
SPSA	1018	895	2614	6207	3396	10059	*40e-2/1e5*	.	.	.	SPSA [9]

Table 7: Running time excess ERT/$\mathrm{ERT}_{\text{best 2009}}$ on f_{107} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\text{best}}$/D	0.50	0.50	0.90	6.6	14	57	79	101	128	211	$\mathrm{ERT}_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1**	30	14	10	3.9	5.1	7.8	11	13	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	4.4	5.2	4.0	**1.8**	**1.6**	**1.5**	**1.5**	**1.6**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**2.3**	**2.2**	**1.9**	**1.4**	**1.6**	**1.9**	**1.6**	**2.0**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	5.4	**2.4**	5.2	6.0	7.2	8.7	7.6	9.1	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	11	3.6	7.7	**2.6**	**2.2**	**2.1**	**2.1**	**1.8**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	7.3	**2.2**	4.4	**1.5**	**1.3**	**1.3**	**1.7**	**1.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**2.1**	**1.8**	**1.6**	**0.66**	**0.75**	**0.75**	**1.4**	**1.2**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	6.1	11	7.7	**2.4**	**2.5**	**2.1**	**2.0**	**2.0**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	14	32	24	13	15	31	45	80	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	9.2	14	20	6.9	11	3.6	25	84	153	303	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	5.2	**2.7**	**2.7**	**1.3**	**1.2**	**1.2**	**1.1**	**0.98**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	5.6	**1.9**	**2.7**	**1.2**	**1.1**	**1.2**	**1.1**	**1.00**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.5**	**2.0**	6.1	4.5	6.0	5.9	5.7	4.5	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	26	20	31	17	20	37	82	83	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.8**	**2.0**	9.1	8.6	10	8.8	13	20	Basic RCGA [17]
SPSA	16	21	483	1439	3795	4061	3907	14051	*27e-3/1e5*	.	SPSA [9]

Table 8: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{108} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.90	15	101	713	1711	2608	3684	7989	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.2**	17	13	5.6	3.7	14	*26e-4/1e4*	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	30	17	8.8	6.5	41	*29e-4/1e4*	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	30	7.8	5.5	10	38	*60e-4/1e4*	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	17	12	10	8.9	*56e-4/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	49	12	4.1	**2.1**	7.5	54	38	*61e-5/1e4*	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	86	14	5.8	**2.4**	4.7	17	*50e-5/1e4*	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	14	14	6.1	5.7	5.7	17	*48e-5/1e4*	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	145	26	8.7	3.8	4.8	18	40	*51e-5/1e4*	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	87	42	20	18	16	*14e-3/6e3*	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	1612	6028	4047	310	143	67	53	61	188	184	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.2**	5.7	6.0	**3.5**	**0.82**	**0.68**	**0.99**	**1.0**	**0.79**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**3.7**	**3.8**	**1.6**	**0.97**	**0.93**	**1.0**	**1.1**	**0.76**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.4**	**1.0**	**2.3**	**1.8**	**1.6**	**4.1**	**4.5**	**3.7**	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	121	56	24	22	25	*13e-3/6e3*	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**2.3**	**1.3**	12	20	21	28	46	*21e-5/5e4*	Basic RCGA [17]
SPSA	27	126	204	101	101	88	*28e-4/1e5*	.	.	.	SPSA [9]

Table 9: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{109} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.90	4.8	6.3	34	34	48	48	48	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.5**	**2.5**	3.4	4.5	**1.5**	4.3	3.8	5.1	9.2	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**2.6**	**2.0**	**2.8**	**1.4**	**2.3**	**2.3**	3.3	5.3	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1.7**	**1.4**	**2.8**	**1.1**	**1.9**	**1.7**	**2.3**	3.7	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	6.6	3.7	5.0	6.4	9.4	7.4	8.2	15	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	4.3	**2.1**	3.0	**0.97**	**1.8**	**1.7**	**2.5**	3.7	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	5.1	**2.6**	4.0	**1.1**	**1.9**	**1.8**	**2.3**	**3.5**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**2.5**	**1.9**	**3.0**	**0.96**	**1.4**	**1.3**	**1.8**	**2.4**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**2.2**	**1.4**	**2.9**	**0.96**	**1.7**	**1.5**	**1.9**	**2.6**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	3.3	**2.6**	15	7.0	9.0	11	15	31	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	14	21	21	6.9	11	7.0	116	95	889	29122	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	3.2	**2.0**	3.4	**1.2**	**2.0**	**2.4**	3.1	4.8	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**2.0**	**1.4**	3.8	**1.2**	**2.1**	**2.2**	3.4	5.4	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.3**	**2.3**	8.6	5.9	8.8	11	14	24	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	3.3	3.6	12	5.6	10	13	22	36	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.8**	**2.5**	15	10	19	24	36	67	Basic RCGA [17]
SPSA	19	32	282	131	273	349	1660	2432	9217	*72e-6/1e5*	SPSA [9]

Table 10: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{110} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.60	2.2	3.6	17	312	651	1159	2181	4204	4577	ERT_{best}/D
(1,2)-CMA-ES	3.4	**1.7**	23	11	3.4	6.1	6.9	15	34	*22e-5/1e4*	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	15	7.2	7.7	5.7	**2.1**	3.3	4.4	5.5	4.6	15	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**3.1**	3.3	5.2	5.6	**1.5**	**3.2**	8.2	8.0	17	32	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	5.3	15	17	18	4.2	4.7	6.3	8.9	7.6	31	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	3.2	**2.2**	**3.7**	6.0	4.1	5.9	5.4	4.6	3.5	5.0	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	4.8	**3.0**	**3.2**	**1.8**	**1.7**	**1.7**	**1.9**	**1.6**	**1.1**	**1.3**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	4.9	**2.3**	7.3	5.3	**2.1**	4.4	3.9	4.0	**2.6**	3.3	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	4.2	**2.6**	3.9	8.2	**2.8**	3.3	**2.9**	**2.8**	**2.8**	**2.7**	(1,4s)-CMA-ES [3]
avg NEWUOA	3.8	10	11	5.1	**2.5**	**3.0**	6.8	11	5.9	*12e-4/5e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	211	120	89	24	13	201	1238	*99e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.3	**2.3**	**3.7**	**3.7**	6.1	5.3	3.2	**1.7**	**0.94**	**0.90**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	7.3	3.6	4.6	8.0	4.2	5.1	**3.2**	**1.9**	**0.99**	**0.96**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.6**	**2.2**	6.6	285	16	15	9.1	5.1	**2.7**	**2.6**	CMA+DE-MOS [13]
NEWUOA	22	15	16	15	**2.9**	4.4	9.1	36	*19e-4/5e3*	.	NEWUOA [16]
Basic RCGA	**2.4**	**2.0**	**3.1**	**4.1**	5.1	22	33	39	55	157	Basic RCGA [17]
SPSA	531	198	339	832	1381	*38e-2/1e5*	.	.	.	.	SPSA [9]

Table 11: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{111} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.60	3.7	12	59	359	2707	6359	14589	30930	84555	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	18	7.2	5.9	8.5	12	6.2	*21e-3/1e4*	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	3.4	8.2	9.0	3.6	11	26	*30e-3/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	20	16	11	8.9	7.3	12	*17e-3/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	36	7.8	8.9	10	6.8	12	*15e-3/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	62	21	12	4.7	**5.5**	3.5	**5.1**	**4.9**	4.8	*61e-4/1e4*	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	58	15	11	6.7	5.8	**2.9**	11	*47e-4/1e4*	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	20	5.4	**3.6**	4.5	6.3	6.9	11	*12e-3/1e4*	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	8.7	16	11	7.6	9.2	3.4	7.3	*17e-4/1e4*	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	72	48	45	29	53	33	*26e-2/6e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	570	605	196	64	22	15	33	101	48	*22e-4/1e5*	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	4.6	**2.7**	7.5	3.3	**3.9**	**3.2**	**3.9**	**2.4**	**1.3**	**0.51**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**3.3**	4.3	5.0	**3.3**	**4.8**	**2.0**	**4.3**	**2.6**	**1.3**	**0.55**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.7**	**1.4**	**2.0**	**2.2**	44	23	12	6.1	**3.3**	**1.3**	CMA+DE-MOS [13]
NEWUOA	137	33	21	25	19	11	*68e-3/6e3*	.	.	.	NEWUOA [16]
Basic RCGA	**2.5**	**1.1**	**1.1**	**1.5**	9.1	4.0	5.7	16	24	*32e-5/5e4*	Basic RCGA [17]
SPSA	73	23	52	152	173	544	*51e-3/1e5*	.	.	.	SPSA [9]

Table 12: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{112} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.60	2.0	2.7	7.3	312	522	577	618	686	766	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	6.1	4.1	9.2	25	6.2	4.8	5.2	5.7	6.6	6.2	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.9**	**2.5**	34	81	3.8	3.4	4.2	4.1	3.9	3.6	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	4.6	3.7	7.8	46	**2.1**	**2.0**	**2.2**	**2.2**	**2.1**	**2.0**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	12	6.8	8.2	104	8.9	15	24	36	33	56	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	6.4	3.7	5.0	11	**0.83**	**0.93**	**1.00**	**1.1**	**1.0**	**1.0**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	7.1	3.9	**4.5**	**4.3**	**0.62**	**0.72**	**0.82**	**0.86**	**0.83**	**0.86**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	4.1	**2.4**	6.3	15	**0.88**	**0.70**	**0.72**	**0.72**	**0.69**	**0.69**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	3.2	**2.3**	**4.5**	12	**1.1**	**0.95**	**0.97**	**0.99**	**0.94**	**0.91**	(1,4s)-CMA-ES [3]
avg NEWUOA	4.7	**2.5**	5.1	11	**1.1**	4.6	22	118	*19e-4/5e3*	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	36	28	27	44	5.0	79	309	*12e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.1	**1.7**	4.9	16	**1.0**	**0.88**	**0.91**	**0.94**	**0.90**	**0.91**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.7**	**2.2**	**4.0**	**5.1**	**0.64**	**0.92**	**1.1**	**1.2**	**1.1**	**1.3**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.6**	**2.3**	6.7	11	**1.1**	**1.8**	**2.1**	**2.2**	**2.3**	**2.7**	CMA+DE-MOS [13]
NEWUOA	5.1	**2.7**	5.0	13	**1.2**	**1.7**	10	112	101	*70e-5/5e3*	NEWUOA [16]
Basic RCGA	4.6	3.0	8.9	**9.0**	4.2	43	85	114	240	447	Basic RCGA [17]
SPSA	12128	3760	2996	3330	671	2693	2435	*21e-2/1e5*	.	.	SPSA [9]

Table 13: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{113} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	1.1	2.4	16	44	70	87	87	87	438	ERT_{best}/D
(1,2)-CMA-ES	**1.9**	8.4	8.0	7.3	13	23	34	34	34	12	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.3**	4.6	4.4	**3.9**	**7.6**	**7.8**	10	10	10	4.0	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**2.8**	4.9	4.5	6.6	12	19	22	22	22	5.0	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	14	8.4	10	9.3	14	18	39	39	39	11	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.0**	**2.0**	**2.9**	15	14	13	16	16	16	4.2	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.8**	16	8.8	6.5	12	12	16	16	16	3.5	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	3.4	3.8	3.6	7.0	15	12	**10**	**10**	**10**	**2.1**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.9**	5.6	13	8.4	16	17	14	14	14	4.0	(1,4s)-CMA-ES [3]
avg NEWUOA	**2.1**	13	10	6.1	**10**	19	33	33	33	13	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	35	29	17	41	350	978	1184	1184	1184	556	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.4**	3.0	**2.2**	10	17	12	14	14	14	**2.8**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.3**	**2.6**	3.8	19	15	**11**	**9.4**	**9.4**	**9.4**	**2.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.4**	**2.1**	**3.1**	**3.9**	**6.3**	**6.9**	**7.4**	**7.4**	**7.4**	**1.9**	CMA+DE-MOS [13]
NEWUOA	**2.4**	8.7	12	5.8	16	29	42	42	42	14	NEWUOA [16]
Basic RCGA	**1.5**	**1.6**	4.7	**3.7**	85	177	212	212	212	52	Basic RCGA [17]
SPSA	17	18	19	1040	901	3536	2899	2899	2899	761	SPSA [9]

Table 14: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{114} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.83	4.4	21	349	1237	2671	2671	2671	4340	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.5**	28	7.0	15	6.3	9.2	25	25	25	33	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	17	43	14	12	4.6	6.2	6.9	6.9	6.9	*32e-4/1e4*	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	8.8	41	26	19	5.7	6.6	17	17	17	*63e-4/1e4*	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	17	33	12	13	8.3	7.4	7.8	7.8	7.8	16	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.9**	43	17	12	**3.8**	4.1	4.8	4.8	4.8	17	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.5**	19	7.6	15	5.7	6.4	5.1	5.1	5.1	8.0	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	4.5	71	31	20	4.5	**3.4**	7.0	7.0	7.0	10	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.4**	44	14	19	7.1	13	7.6	7.6	7.6	**4.7**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.5**	66	29	16	26	21	33	33	33	20	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	618	605	211	197	60	33	21	21	21	45	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.8**	14	8.6	10	**2.8**	**1.7**	**1.7**	**1.7**	**1.7**	**1.3**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.9**	**4.2**	**2.6**	**5.6**	**1.6**	**0.73**	**0.84**	**0.84**	**0.84**	**0.83**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.4**	**2.8**	**1.3**	**3.8**	8.9	4.3	**2.2**	**2.2**	**2.2**	5.0	CMA+DE-MOS [13]
NEWUOA	**1.9**	41	69	53	38	71	33	33	33	*21e-2/6e3*	NEWUOA [16]
Basic RCGA	**1.8**	**1.8**	**1.1**	**6.3**	18	22	20	20	20	17	Basic RCGA [17]
SPSA	99	270	107	184	81	88	118	118	118	*63e-4/1e5*	SPSA [9]

Table 15: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{115} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	1.0	1.6	6.4	112	180	197	197	197	271	ERT_{best}/D
(1,2)-CMA-ES	**2.0**	3.8	5.0	7.0	**1.8**	4.3	6.9	6.9	6.9	19	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.2**	**2.4**	6.2	5.1	**1.6**	**2.3**	5.5	5.5	5.5	16	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.9**	**2.1**	5.3	4.9	**1.5**	**2.9**	6.0	6.0	6.0	13	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1.7**	**1.9**	5.2	7.3	**1.6**	7.4	9.1	9.1	9.1	18	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.4**	**2.2**	4.7	**4.9**	**1.1**	**2.2**	**2.5**	**2.5**	**2.5**	3.0	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.3**	**2.5**	**3.1**	**4.9**	**1.3**	**2.3**	**2.2**	**2.2**	**2.2**	**2.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.9**	**2.2**	**3.4**	5.9	**0.91**	**1.2**	**2.0**	**2.0**	**2.0**	**1.8**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.5**	4.3	6.1	**3.9**	**0.89**	**1.9**	**2.2**	**2.2**	**2.2**	**2.6**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.5**	**2.8**	6.5	7.3	**2.9**	6.1	7.1	7.1	7.1	12	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	14	12	14	18	99	325	551	551	551	1224	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.3**	3.3	**3.8**	5.4	**1.4**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.7**	4.5	5.2	14	**2.2**	**2.4**	**2.5**	**2.5**	**2.5**	**2.2**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.4**	**2.1**	4.1	5.6	**1.9**	**2.0**	6.3	6.3	6.3	5.3	CMA+DE-MOS [13]
NEWUOA	**2.0**	**2.5**	4.5	12	**2.9**	4.4	11	11	11	11	NEWUOA [16]
Basic RCGA	**1.6**	**1.9**	5.2	59	24	101	113	113	113	136	Basic RCGA [17]
SPSA	47	48	110	435	151	268	778	778	778	2416	SPSA [9]

Table 16: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{116} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.3	6.8	25	50	78	103	138	165	521	894	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	12	12	13	23	31	70	102	194	131	160	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.0**	9.4	22	28	48	128	116	159	64	50	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.4**	4.4	11	**10**	35	69	88	189	135	166	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	13	40	16	26	39	165	*12e-3/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.9**	**2.2**	15	20	35	44	42	**36**	16	9.4	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.9**	**2.5**	10	25	34	49	48	46	18	12	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.8**	8.0	15	20	**21**	**34**	**35**	37	14	9.4	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.5**	**2.3**	**6.4**	24	**30**	49	51	50	19	14	(1,4s)-CMA-ES [3]
avg NEWUOA	7.9	6.2	12	**15**	32	98	125	479	*14e-3/5e3*	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	67	132	512	1079	3593	6360	10202	*34e-2/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.2	**2.9**	25	22	**19**	**15**	**14**	**12**	**3.9**	**2.4**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.7**	3.8	28	42	36	**36**	**30**	**26**	**8.4**	**5.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.2**	3.7	33	83	70	56	44	38	**13**	**7.9**	CMA+DE-MOS [13]
NEWUOA	5.4	4.6	**6.3**	**18**	38	107	571	*50e-3/5e3*	.	.	NEWUOA [16]
Basic RCGA	**1.9**	4.5	**4.6**	102	476	859	1611	2102	670	817	Basic RCGA [17]
SPSA	20	19	61	307	1150	4537	10864	*43e-3/1e5*	.	.	SPSA [9]

Table 17: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{117} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	4.8	17	84	673	3227	6957	14112	14949	18210	21616	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	9.2	8.6	8.9	6.0	5.6	*12e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	6.6	7.5	8.0	5.4	5.7	21	11	*11e-2/1e4*	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	8.8	7.7	10	**3.7**	6.9	*14e-2/1e4*	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	10	8.4	9.4	8.6	13	*31e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	11	9.3	10	3.8	**2.0**	10	*36e-3/1e4*	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	14	6.2	7.3	**3.3**	6.0	10	*12e-2/1e4*	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	15	13	10	4.6	3.3	6.0	10	*59e-3/1e4*	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	7.9	8.7	**4.8**	4.5	**2.7**	**3.9**	11	*33e-3/1e4*	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	15	32	24	10	8.4	*78e-2/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	50	112	115	32	62	103	103	*17e-2/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	5.5	5.5	**5.0**	**3.6**	**1.8**	**0.99**	**0.67**	**0.67**	**0.61**	**0.63**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**3.2**	**4.8**	10	4.5	**2.0**	**1.5**	**0.95**	**0.96**	**0.95**	**0.93**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.1**	**1.2**	**1.6**	3.7	4.2	4.3	**2.4**	**2.6**	**2.4**	**2.9**	CMA+DE-MOS [13]
NEWUOA	43	25	29	12	26	*97e-2/6e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.7**	**1.6**	5.9	22	15	13	11	*73e-3/5e4*	.	.	Basic RCGA [17]
SPSA	58	41	80	129	131	214	105	*35e-2/1e5*	.	.	SPSA [9]

Table 18: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{118} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	2.1	2.5	10	52	66	252	292	326	388	486	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	7.5	12	55	19	18	5.4	5.1	5.5	5.1	4.6	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.6**	5.5	45	18	17	4.7	4.3	4.0	3.6	3.2	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	4.4	11	20	8.4	7.7	**2.8**	**2.7**	**2.7**	**2.4**	**2.1**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	3.2	14	131	52	64	24	25	23	20	16	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	3.6	6.6	12	4.7	4.1	**1.4**	**1.3**	**1.2**	**1.1**	**1.0**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	3.7	6.6	9.1	3.5	3.9	**1.2**	**1.1**	**1.2**	**1.0**	**1.0**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	3.6	7.3	5.9	**2.0**	**2.2**	**0.68**	**0.65**	**0.65**	**0.60**	**0.56**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.4**	**3.9**	**4.8**	**2.8**	**3.2**	**0.93**	**0.93**	**0.91**	**0.82**	**0.72**	(1,4s)-CMA-ES [3]
avg NEWUOA	**2.4**	**2.3**	**2.8**	3.8	12	9.0	21	221	*90e-5/5e3*	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	42	142	61	44	533	615	1377	1231	3617	2888	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.0	8.1	7.9	**3.4**	**3.7**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	3.8	6.5	12	4.8	5.7	**2.4**	**2.5**	**2.4**	**2.2**	**1.9**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.5**	10	8.6	4.8	6.0	**2.0**	**2.2**	**2.5**	**2.5**	**2.9**	CMA+DE-MOS [13]
NEWUOA	**2.1**	**2.6**	**5.6**	4.2	11	10	35	71	187	*11e-4/5e3*	NEWUOA [16]
Basic RCGA	4.0	5.4	76	100	462	253	280	1078	907	*16e-3/5e4*	Basic RCGA [17]
SPSA	61	400	1210	755	4425	5579	*20e-2/1e5*	.	.	.	SPSA [9]

Table 19: Running time excess $\mathrm{ERT}/\mathrm{ERT}_{\text{best 2009}}$ on f_{119} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\text{best}}$/D	0.50	0.50	0.70	5.4	36	88	520	950	2384	5041	$\mathrm{ERT}_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1.1**	**2.5**	4.0	6.4	6.7	3.9	7.4	7.7	29	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**2.0**	3.1	8.4	4.0	**2.8**	**1.2**	**2.2**	3.3	14	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.2**	**2.0**	5.4	**2.8**	**2.4**	**2.1**	3.1	**2.9**	8.7	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.6**	**2.2**	4.9	4.4	7.0	4.8	15	61	*90e-6/1e4*	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**2.1**	3.3	4.0	3.9	**1.9**	**1.1**	**1.5**	**1.9**	8.8	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.1**	**2.1**	6.8	**2.3**	**1.5**	**1.5**	**2.0**	**1.6**	6.1	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.9**	**3.0**	5.6	**1.4**	**1.6**	**0.70**	**1.3**	**1.3**	14	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.4**	**3.0**	13	3.6	3.1	**1.0**	**2.2**	**2.1**	9.0	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.4**	**2.9**	18	8.0	14	5.9	6.6	6.8	*67e-6/5e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	12	20	17	**3.7**	**1.8**	13	81	83	183	*34e-6/1e5*	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.1**	**1.7**	6.6	**1.7**	**1.3**	**0.78**	**1.6**	**1.0**	**0.76**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.7**	3.8	7.9	**2.2**	**1.5**	**1.1**	**2.5**	**1.6**	**1.9**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.2**	**1.9**	**2.8**	5.1	5.7	**1.5**	**1.2**	**0.67**	**0.55**	CMA+DE-MOS [13]
NEWUOA	**1**	**2.6**	3.1	15	8.6	23	7.1	19	33	15	NEWUOA [16]
Basic RCGA	**1**	**1.2**	**1.4**	**2.2**	3.2	8.8	4.5	11	10	19	Basic RCGA [17]
SPSA	15	32	35	933	1158	2645	838	*21e-3/1e5*	.	.	SPSA [9]

Table 20: Running time excess $\mathrm{ERT}/\mathrm{ERT}_{\text{best 2009}}$ on f_{120} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\text{best}}$/D	0.50	0.50	0.70	5.7	187	1257	2862	12965	37703	94320	$\mathrm{ERT}_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1.7**	19	34	6.0	7.5	*76e-4/1e4*	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.1**	19	19	4.7	14	*12e-3/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**2.9**	22	19	4.9	8.2	*52e-4/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.1**	12	33	9.3	13	52	*15e-3/1e4*	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.3**	**2.6**	41	4.4	7.4	**15**	*56e-4/1e4*	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.5**	36	26	5.0	**4.3**	49	*25e-4/1e4*	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.5**	17	26	4.9	4.3	*54e-4/1e4*	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1.6**	9.5	3.9	7.9	*79e-4/1e4*	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	9.5	37	74	42	15	*94e-3/6e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	423	709	620	222	37	66	247	*53e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.2**	**2.0**	**8.7**	**2.4**	**0.94**	**1.1**	**0.68**	**0.53**	**0.56**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.5**	3.5	23	**3.5**	**1.5**	**1.5**	**0.78**	**0.45**	**0.64**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.3**	**1.9**	**4.5**	**3.0**	4.4	16	**11**	**4.1**	**5.7**	CMA+DE-MOS [13]
NEWUOA	**1**	3.1	48	61	41	34	*98e-3/6e3*	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.3**	**2.0**	**1.6**	6.8	13	19	16	19	*31e-5/5e4*	Basic RCGA [17]
SPSA	57	173	152	151	107	254	*13e-3/1e5*	.	.	.	SPSA [9]

Table 21: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{121} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.70	3.5	21	72	164	376	560	851	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.6**	**2.3**	3.8	**2.5**	4.1	6.6	5.9	7.5	10	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.3**	**2.2**	**2.5**	**2.0**	**1.1**	**1.5**	**2.9**	3.5	4.9	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.3**	**2.5**	3.4	**1.0**	**1.1**	**1.3**	**1.7**	**2.2**	**2.7**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.3**	4.1	5.0	**1.8**	3.4	16	18	30	84	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.2**	3.1	3.2	**1.5**	**0.99**	**0.92**	**0.85**	**1.1**	**1.4**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.5**	**2.9**	3.2	**1.6**	**1.3**	**1.3**	**1.4**	**1.3**	**1.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.2**	**2.2**	**2.0**	**0.97**	**0.68**	**0.70**	**0.72**	**0.71**	**0.71**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.7**	**2.7**	**2.8**	**1.1**	**0.78**	**0.69**	**0.72**	**0.73**	**0.79**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.6**	**2.6**	5.7	4.4	6.3	22	35	*31e-5/5e3*	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	15	25	22	31	10	10	61	339	2516	*13e-5/1e5*	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.3**	**2.7**	3.1	**1.4**	**1.2**	**1.3**	**1.1**	**1.2**	**1.4**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**2.0**	4.1	3.7	**1.6**	**1.0**	**1.6**	**2.0**	**2.2**	**2.6**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.2**	**2.1**	4.1	5.7	3.8	3.9	**2.9**	**2.9**	3.3	CMA+DE-MOS [13]
NEWUOA	**1**	**1.6**	**2.7**	4.4	3.0	7.6	14	57	121	*40e-5/5e3*	NEWUOA [16]
Basic RCGA	**1**	**1.3**	**1.7**	**2.0**	8.0	6.2	14	15	37	104	Basic RCGA [17]
SPSA	33	60	126	806	2749	1758	1936	*13e-3/1e5*	.	.	SPSA [9]

Table 22: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{122} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	1.5	48	261	705	1122	1676	2176	4781	ERT_{best}/D
(1,2)-CMA-ES	**1**	**2.9**	14	5.0	4.8	12	61	*53e-4/1e4*	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.3**	**2.3**	**3.3**	**1.6**	4.9	10	19	32	*98e-5/1e4*	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.7**	12	3.7	3.1	4.1	38	*32e-4/1e4*	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.6**	23	4.2	7.0	22	*16e-3/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.3**	5.7	5.9	3.3	3.1	4.7	14	32	*23e-5/1e4*	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.1**	4.7	3.8	**2.5**	**2.8**	**3.3**	6.0	7.6	31	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.4**	31	**2.2**	**2.1**	**2.4**	5.9	14	20	*38e-5/1e4*	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.9**	36	4.4	5.7	7.3	20	27	67	*32e-4/1e4*	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.3**	14	10	33	55	*11e-2/5e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	12	16	16	21	37	91	195	*53e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.3**	3.5	**1.2**	**0.81**	**0.78**	**0.75**	**0.69**	**0.90**	**0.60**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.3**	29	3.9	**2.5**	**1.2**	**1.1**	**1.00**	**0.98**	**0.74**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.4**	**2.1**	30	21	10	7.5	**5.8**	**5.1**	**2.9**	CMA+DE-MOS [13]
NEWUOA	**1**	**1.7**	10	16	30	54	*99e-3/5e3*	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**2.2**	10	22	14	21	25	45	*25e-6/5e4*	Basic RCGA [17]
SPSA	21	38	60	803	*44e-2/1e5*	.	.	.	.	.	SPSA [9]

Table 23: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{123} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 Uniform

Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D	1e+03 0.50	1e+02 0.50	1e+01 1.6	1e+00 106	1e-01 3186	1e-02 12428	1e-03 19367	1e-04 28294	1e-05 50007	1e-07 1.09e5	Δftarget $\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.8**	26	7.1	47	*24e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.2**	**2.8**	18	**4.8**	7.2	*13e-2/1e4*	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.1**	6.1	30	7.5	45	*23e-2/1e4*	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.2**	48	10	22	*18e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.8**	21	8.6	**3.5**	*83e-3/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.3**	**7.3**	**4.7**	11	*13e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**2.0**	29	6.3	4.4	**12**	*98e-3/1e4*	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**2.8**	78	6.8	11	*11e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	10	66	24	28	*46e-2/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	261	1354	557	126	20	25	*48e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.0**	19	5.7	**0.88**	**0.54**	**0.71**	**0.81**	**0.67**	**0.82**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.6**	18	**3.7**	**0.74**	**0.69**	**1.0**	**0.90**	**0.75**	**0.72**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.5**	**1.9**	40	39	18	**15**	**11**	**7.9**	**5.2**	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	56	32	28	*44e-2/6e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.5**	**2.9**	21	23	*11e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	32	64	137	76	221	*22e-2/1e5*	.	.	.	.	SPSA [9]

Table 24: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{124} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.50	0.50	1.8	32	158	340	996	1737	2798	4510	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**2.1**	3.9	13	14	26	69	*60e-4 /1e4*	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.8**	**3.0**	3.4	**1.9**	4.5	12	*98e-5/1e4*	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.9**	3.1	**2.8**	4.5	5.5	8.4	82	*89e-5/1e4*	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.7**	15	12	13	44	*16e-3/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	3.9	3.3	7.8	4.5	6.4	8.0	25	*23e-5/1e4*	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.4**	3.2	4.5	**1.4**	**2.7**	3.2	10	50	*23e-5/1e4*	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.8**	26	5.1	**1.8**	**1.6**	**1.7**	11	51	*23e-5/1e4*	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.1**	**1.5**	**1.8**	10	4.6	5.0	8.0	85	*42e-5/1e4*	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.7**	12	9.3	22	61	*98e-3/5e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	14	20	36	11	38	142	226	814	*19e-4/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.8**	**2.2**	**1.0**	**0.89**	**1.5**	**1.1**	**1.1**	**1.5**	**2.0**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.4**	3.5	**1.2**	**0.69**	**0.81**	**1.3**	**1.4**	**2.0**	**2.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.5**	**1.9**	3.1	15	20	10	**6.2**	**7.8**	**7.4**	CMA+DE-MOS [13]
NEWUOA	**1**	**2.2**	5.6	6.5	14	46	*33e-3/5e3*	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.1**	**1.2**	3.0	23	25	33	56	130	*19e-5/5e4*	Basic RCGA [17]
SPSA	48	90	4547	844	468	2050	*37e-3/1e5*	.	.	.	SPSA [9]

Table 25: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{125} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget ERT_{best}/D	1e+03 0.50	1e+02 0.50	1e+01 0.50	1e+00 0.50	1e-01 0.50	1e-02 74	1e-03 575	1e-04 1228	1e-05 1927	1e-07 3778	Δftarget ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	5.6	14	105	4.4	4.1	4.0	6.1	*63e-7/1e4*	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	5.8	54	**1.6**	**2.8**	3.1	5.5	12	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	**3.9**	**34**	**2.6**	3.4	4.4	7.0	18	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1.1**	11	137	3.2	5.5	4.4	7.6	38	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	**4.5**	**25**	**1.9**	5.7	5.2	7.9	12	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1.1**	5.9	49	**2.5**	4.0	3.5	3.8	4.1	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	5.5	61	3.1	3.4	**2.1**	3.1	6.5	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1.2**	5.2	**31**	**1.8**	6.1	6.0	6.2	18	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**2.3**	6.9	46	**1.8**	**2.7**	**2.4**	**2.3**	6.2	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	14	20	25	34	87	5.0	5.4	6.8	14	40	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.1**	**4.7**	53	**1.4**	**1.5**	**1.0**	**1.4**	**0.94**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.2**	5.9	34	**2.1**	**2.0**	**1.3**	**1.9**	**1.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	5.8	44	**1.2**	**0.47**	3.3	**2.2**	**1.2**	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.0**	6.1	77	**1.4**	**2.6**	**2.1**	**2.6**	10	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.2**	6.4	58	**1.9**	**2.7**	4.7	5.0	13	Basic RCGA [17]
SPSA	22	32	37	61	169	**2.2**	98	230	344	*45e-5/1e5*	SPSA [9]

Table 26: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{126} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.50	0.50	0.50	151	1709	3408	5528	18193	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**2.3**	53	300	7.2	6.8	20	26	*75e-5/1e4*	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.1**	**4.2**	141	6.3	4.8	6.0	8.0	*23e-5/1e4*	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	**3.5**	236	4.0	8.9	7.9	27	*81e-5/1e4*	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1.1**	39	246	9.1	8.5	12	25	*12e-4/1e4*	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	6.3	336	4.4	3.6	9.0	12	7.7	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	7.4	111	3.3	3.9	3.8	5.6	*64e-6/1e4*	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1.1**	41	113	**2.3**	3.1	3.6	5.5	8.0	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	12	256	3.4	4.8	4.7	*18e-5/1e4*	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	26	95	667	15	11	7.8	*18e-4/6e3*	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	284	472	608	704	1604	57	22	40	37	*32e-6/1e5*	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	4.5	230	**1.9**	**1.4**	**1.0**	**0.97**	**1.5**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	**4.2**	**73**	**1.9**	**1.1**	**2.0**	**2.2**	**1.6**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	**3.9**	**49**	**0.58**	12	18	20	19	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.1**	200	595	15	52	*32e-4/6e3*	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	4.6	**47**	**0.72**	**0.98**	**1.3**	**1.4**	**2.0**	Basic RCGA [17]
SPSA	16	50	86	193	1851	88	111	95	80	*18e-4/1e5*	SPSA [9]

Table 27: Running time excess ERT/$\mathrm{ERT}_{\text{best 2009}}$ on f_{127} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\text{best}}$/D	0.50	0.50	0.50	0.50	0.50	93	593	2014	3386	3638	$\mathrm{ERT}_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	10	53	**2.5**	5.1	**2.8**	**2.7**	4.9	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.1**	6.4	39	**1.2**	**2.0**	**0.95**	**0.86**	**1.6**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	4.9	33	**1.1**	**2.7**	**1.6**	**1.4**	**1.6**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1.2**	11	86	**2.5**	8.2	3.6	3.7	19	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	**3.5**	**17**	**2.7**	3.5	**2.1**	**1.3**	**1.6**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	4.3	**21**	**2.6**	3.0	**1.7**	**1.4**	**1.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1.1**	4.3	**21**	**2.7**	**2.7**	**1.2**	**0.81**	**0.97**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	**3.3**	82	**2.1**	**2.4**	**0.94**	**0.72**	**0.69**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**1.3**	7.2	72	**1.6**	3.5	**1.8**	**2.5**	*16e-6/5e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	12	17	19	28	70	**1.6**	**2.2**	4.6	12	66	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.4**	6.1	39	**2.5**	**2.7**	**1.1**	**0.77**	**0.85**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	4.2	78	**1.2**	**1.7**	**1.0**	**0.72**	**1.6**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	3.9	31	**0.89**	**0.88**	**1.5**	**2.6**	3.5	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.1**	6.2	95	**1.8**	4.9	3.8	**2.8**	9.0	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.2**	**3.7**	41	**1.4**	4.0	**2.6**	**2.5**	29	Basic RCGA [17]
SPSA	26	39	94	636	4930	125	181	165	*40e-5/1e5*	.	SPSA [9]

Table 28: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{128} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.90	21	67	157	194	205	297	310	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	4.1	10	9.4	6.2	6.9	7.2	5.6	6.8	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**0.93**	**5.6**	**6.1**	5.3	6.2	5.9	4.6	5.7	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1.7**	**2.7**	**3.7**	**3.9**	**4.8**	**5.7**	**4.5**	4.7	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	7.3	8.8	**5.5**	**3.9**	7.1	10	10	11	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1.7**	21	14	6.4	6.9	6.6	4.6	**4.5**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**2.1**	12	12	7.1	6.1	**5.8**	**4.0**	**4.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1.8**	14	10	**4.2**	**3.6**	**3.7**	**2.6**	**2.5**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1.2**	6.7	10	5.9	**5.2**	7.2	5.6	5.4	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**2.9**	21	9.3	7.9	7.4	8.7	10	32	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	13	19	15	16	44	20	48	76	244	563	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**2.0**	26	16	7.8	11	19	13	14	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**0.78**	9.4	11	8.9	7.3	7.3	5.2	5.2	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.4**	35	84	50	41	40	28	29	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**1.9**	17	10	10	10	16	14	20	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	**1.8**	18	16	30	66	57	149	Basic RCGA [17]
SPSA	10	22	35	309	656	812	2220	2096	*83e-4/1e5*	.	SPSA [9]

Table 29: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{129} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher Uniform

Δftarget ERT_{best}/D	1e+03 0.50	1e+02 0.50	1e+01 0.90	1e+00 33	1e-01 110	1e-02 261	1e-03 951	1e-04 1622	1e-05 2972	1e-07 5330	Δftarget ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	9.3	8.2	13	13	10	17	16	27	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.8**	11	10	7.6	4.7	15	48	*12e-5/1e4*	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1.3**	11	11	11	3.9	12	8.3	27	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	18	8.5	**6.5**	11	8.6	6.3	10	*60e-6/1e4*	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1.3**	8.1	8.9	8.3	3.8	**4.6**	**3.3**	**6.4**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1.7**	**7.0**	**5.7**	**4.3**	**3.0**	**4.9**	**3.7**	8.5	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1.6**	11	9.2	**5.0**	4.3	5.2	5.6	13	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**0.81**	7.6	**5.6**	7.3	**3.6**	5.0	11	*31e-6/1e4*	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	52	25	31	27	9.4	25	29	16	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	288	439	273	92	53	95	39	69	56	274	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.6**	13	13	**6.5**	**2.2**	**2.4**	**3.2**	**5.4**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.7**	7.4	12	9.3	5.6	8.2	4.7	**3.2**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.4**	**1.4**	13	49	28	20	11	6.9	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	24	23	21	26	19	25	31	*37e-4/6e3*	NEWUOA [16]
Basic RCGA	**1**	**1**	**0.85**	**0.64**	13	15	13	11	24	135	Basic RCGA [17]
SPSA	5.1	48	96	100	66	108	55	81	150	*86e-6/1e5*	SPSA [9]

Table 30: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{130} in **02-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.50	0.50	0.77	23	99	248	399	824	886	2221	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**2.0**	40	33	18	13	6.2	7.8	3.2	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.4**	30	16	8.8	5.7	**2.8**	**2.7**	**1.1**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1.5**	14	15	11	7.2	4.5	4.2	**1.8**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**2.6**	41	54	32	20	10	10	4.3	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**2.0**	22	13	6.2	4.5	**2.2**	**2.0**	**0.84**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**2.4**	15	10	7.0	4.6	**2.3**	**2.2**	**0.89**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1.4**	**6.5**	8.8	**5.2**	**3.3**	**1.6**	**1.9**	**0.76**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1.3**	9.0	13	5.3	**3.4**	**1.6**	**1.5**	**0.63**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	3.2	8.2	**3.7**	**2.6**	**3.6**	3.9	7.5	6.9	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	8.8	12	11	7.8	22	18	30	71	130	127	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.5**	6.6	6.5	39	26	13	12	33	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.2**	8.3	18	8.7	5.8	3.1	**3.0**	**1.2**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.7**	**1.1**	**0.97**	10	24	20	18	15	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.8**	10	**5.4**	**3.7**	3.8	3.6	4.7	6.6	NEWUOA [16]
Basic RCGA	**1**	**1**	**2.0**	**1.1**	8.5	21	37	45	63	76	Basic RCGA [17]
SPSA	22	34	84	662	510	298	243	285	486	311	SPSA [9]

Table 31: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{101} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	1.2	4.4	6.3	6.7	9.3	11	11	13	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	5.6	4.9	7.3	12	10	10	12	13	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.6**	**2.8**	6.0	7.7	7.6	8.3	9.3	11	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.2**	4.7	3.1	5.7	7.0	6.4	7.3	8.5	10	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	6.9	5.3	7.4	10	10	11	12	14	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	3.6	**3.0**	4.2	5.9	5.5	6.2	7.4	8.2	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**2.6**	**2.9**	3.6	5.2	5.1	5.7	6.4	7.4	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	3.3	**2.6**	**3.1**	**4.1**	**3.9**	**4.2**	**4.9**	**5.5**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	3.6	3.2	3.6	5.0	4.5	4.8	5.5	6.5	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.1**	3.4	**1.6**	**1.7**	**1.9**	**1.5**	**1.4**	**1.4**	**1.4**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	14	21	16	12	112	384	484	694	1414	1256	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	4.0	3.8	5.0	7.6	7.2	7.9	9.2	11	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	3.8	3.0	5.1	7.5	7.2	8.1	9.3	11	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**2.5**	10	21	28	28	30	36	42	CMA+DE-MOS [13]
NEWUOA	**1**	**1.5**	**2.8**	**2.0**	**2.5**	**2.9**	**2.4**	**2.2**	**2.3**	**2.2**	NEWUOA [16]
Basic RCGA	**1**	**1.1**	**2.4**	10	36	73	88	132	182	315	Basic RCGA [17]
SPSA	30	46	198	295	846	1989	1524	1398	1375	3664	SPSA [9]

Table 32: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{102} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	1.2	4.0	7.6	9.3	11	12	13	16	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	5.6	5.6	5.9	7.2	8.1	9.5	11	11	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	3.3	3.9	4.6	5.4	6.2	7.1	7.6	8.6	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	3.1	3.1	4.1	4.9	5.4	6.5	7.1	7.6	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	4.3	5.8	5.3	7.4	8.1	8.9	8.6	14	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	3.2	**2.7**	**2.9**	3.6	4.3	5.1	5.6	6.0	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	4.2	3.3	3.3	4.0	4.7	5.2	5.7	6.0	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**2.6**	**2.2**	**2.2**	**3.1**	**3.4**	**3.9**	**4.1**	**4.5**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	3.0	**2.6**	**2.5**	**3.4**	**3.9**	**4.3**	**4.6**	**5.1**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.9**	3.6	**2.8**	**2.9**	**2.6**	**2.8**	**2.7**	**2.5**	**2.2**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	28	45	21	14	15	19	21	149	1947	4298	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	4.2	3.9	4.1	5.3	6.4	7.2	7.7	8.5	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	4.4	4.2	4.4	5.6	6.7	7.8	8.4	8.8	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**2.5**	11	17	21	25	29	30	34	CMA+DE-MOS [13]
NEWUOA	**1**	**1.5**	5.9	5.7	5.4	7.2	6.8	8.1	9.1	10	NEWUOA [16]
Basic RCGA	**1**	**1.1**	**1.7**	17	29	43	77	115	167	242	Basic RCGA [17]
SPSA	24	38	470	396	697	2079	2142	2293	5383	87971	SPSA [9]

Table 33: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{103} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	1.2	4.3	6.4	6.4	6.4	6.6	7.7	14	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	6.2	5.1	6.7	10	14	18	19	14	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**2.5**	**2.8**	4.5	7.5	10	12	13	10	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**2.7**	3.0	4.4	7.2	8.7	11	12	9.1	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	3.9	4.3	5.2	7.7	12	15	17	13	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	4.0	3.5	4.0	6.1	7.8	10	11	8.5	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**2.5**	**2.1**	3.9	5.8	7.8	9.4	10	**7.3**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1.9**	**2.0**	**2.6**	**4.1**	**5.1**	**6.8**	**6.9**	**5.3**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	3.8	**2.3**	3.3	5.0	6.7	**8.5**	**8.0**	**6.1**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.9**	3.3	**1.7**	**1.6**	**2.0**	**5.6**	9.2	10	9.0	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	17	30	19	16	22	27	34	1298	2202	2619	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**2.4**	**2.9**	4.6	7.8	10	13	13	10	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	4.0	3.5	4.8	7.9	11	14	14	11	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**2.5**	11	20	31	42	53	62	51	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	3.4	**2.1**	**2.6**	**3.4**	**4.8**	**5.9**	**5.8**	10	NEWUOA [16]
Basic RCGA	**1**	**1.1**	**2.3**	13	39	69	140	225	281	291	Basic RCGA [17]
SPSA	40	142	360	216	228	400	565	1216	4576	11577	SPSA [9]

Table 34: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{104} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	1.4	7.2	10	69	201	212	216	218	219	223	ERT_{best}/D
(1,2)-CMA-ES	4.2	3.1	6.6	10	14	36	50	88	88	86	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.5**	**1.4**	3.9	4.5	5.7	8.2	8.4	8.9	9.0	9.1	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3.5	**1.6**	**2.4**	**2.5**	6.5	11	11	11	11	11	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	15	9.1	17	15	23	62	116	115	145	143	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.7**	**1.5**	**2.2**	5.3	3.3	3.3	3.4	3.5	3.5	3.6	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	3.6	**1.3**	**2.0**	**2.0**	**1.2**	**1.4**	**1.5**	**1.6**	**1.6**	**1.7**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.1**	**1.1**	**1.5**	**1.8**	**1.1**	**1.3**	**1.3**	**1.4**	**1.4**	**1.5**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	3.9	**1.5**	**2.1**	5.6	4.3	5.8	5.8	5.9	5.9	5.9	(1,4s)-CMA-ES [3]
avg NEWUOA	**2.5**	**0.83**	**0.89**	3.0	**2.6**	3.3	3.4	4.1	4.1	4.1	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	61	19	29	138	255	242	239	314	312	315	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.4**	**1.2**	**2.7**	**1.9**	**1.3**	**1.5**	**1.7**	**1.8**	**1.9**	**2.0**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.7**	**2.1**	3.3	**2.7**	**2.0**	**2.5**	**2.8**	**2.9**	3.1	3.3	IPOP-CMA-ES [15]
CMA+DE-MOS	3.4	3.3	8.6	3.2	**3.0**	3.9	4.6	5.1	5.4	6.1	CMA+DE-MOS [13]
NEWUOA	**2.8**	**0.92**	**0.95**	**0.95**	**2.7**	8.2	18	28	34	40	NEWUOA [16]
Basic RCGA	3.4	4.0	11	40	169	561	1528	1543	*66e-3/5e4*	.	Basic RCGA [17]
SPSA	611	299	28922	*15e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 35: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{105} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.4	5.6	9.3	169	357	1076	1082	1087	1090	1099	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	4.1	7.1	8.6	4.9	14	13	27	40	40	131	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.6**	7.5	6.2	**1.7**	6.9	8.4	18	22	30	29	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**2.7**	**2.5**	**2.9**	**1.1**	4.6	5.5	13	40	40	40	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	5.9	7.2	7.0	3.8	12	13	25	42	133	*91e-4/1e4*	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	3.5	**2.3**	3.8	3.3	5.6	4.0	7.0	7.3	7.4	7.3	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	3.7	3.1	3.2	**1.9**	**2.8**	**2.2**	**2.2**	**2.7**	**2.7**	**2.7**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.0**	**1.5**	**1.6**	**1.9**	5.3	**2.4**	**2.5**	**2.5**	**2.5**	**2.5**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	4.0	**2.6**	**2.3**	**2.2**	9.1	4.6	8.1	13	16	16	(1,4s)-CMA-ES [3]
avg NEWUOA	**2.7**	**1.8**	**1.8**	**0.75**	**1.6**	3.2	8.2	35	75	*20e-4/6e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	20	9.1	14	126	410	392	603	601	1289	1279	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.0	**2.6**	3.5	**1.7**	**1.9**	**0.77**	**0.81**	**0.84**	**0.85**	**0.89**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.9**	**2.8**	4.2	**2.4**	4.4	**1.6**	**1.7**	**1.7**	**1.8**	**1.8**	IPOP-CMA-ES [15]
CMA+DE-MOS	3.5	4.2	10	**1.4**	**1.7**	**0.71**	**0.78**	**0.86**	**0.93**	**1.1**	CMA+DE-MOS [13]
NEWUOA	5.0	**2.2**	**1.5**	**0.67**	**1.9**	**2.0**	7.5	21	69	70	NEWUOA [16]
Basic RCGA	**1.4**	5.0	14	11	104	109	220	675	*26e-3/5e4*	.	Basic RCGA [17]
SPSA	514	176	1.51e5	*18e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 36: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{106} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	1.4	7.2	10	23	52	148	253	276	431	482	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	5.2	3.6	4.0	11	12	5.8	4.1	4.1	**2.7**	**2.6**	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	3.1	**2.0**	3.8	13	10	4.3	**2.8**	**2.8**	**1.9**	**1.8**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3.0	**2.3**	4.1	8.3	6.5	**2.9**	**2.0**	**2.0**	**1.3**	**1.3**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	12	9.2	10	40	29	13	8.8	8.8	5.7	5.3	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	5.3	**2.6**	3.1	9.5	6.6	**2.8**	**1.9**	**1.8**	**1.2**	**1.1**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.8**	**1.6**	3.3	9.0	6.1	**2.6**	**1.7**	**1.6**	**1.1**	**1.0**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.7**	**1.2**	**2.1**	5.0	**3.8**	**1.6**	**1.1**	**1.0**	**0.69**	**0.67**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	3.3	**1.4**	**2.3**	7.3	5.4	**2.3**	**1.5**	**1.5**	**0.98**	**0.92**	(1,4s)-CMA-ES [3]
avg NEWUOA	3.1	**1.1**	**1.1**	**2.4**	**1.9**	**1.0**	**2.1**	3.3	5.0	7.5	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	40	17	17	40	24	10	7.1	7.0	4.8	5.4	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.8**	**1.5**	**2.7**	**3.7**	**4.3**	**2.0**	**1.3**	**1.3**	**0.90**	**0.90**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	3.2	**2.3**	3.3	5.1	6.5	3.1	**2.1**	**2.1**	**1.4**	**1.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	3.4	3.9	10	8.6	10	4.8	3.0	3.2	**2.2**	**2.4**	CMA+DE-MOS [13]
NEWUOA	3.0	**0.95**	**1.0**	**3.3**	5.6	4.4	7.4	14	13	33	NEWUOA [16]
Basic RCGA	3.2	4.6	14	145	911	1110	2842	*43e-3/5e4*	.	.	Basic RCGA [17]
SPSA	1188	595	815	9052	*19e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 37: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{107} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	2.0	16	51	77	108	138	168	228	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	22	12	10	22	27	45	203	*28e-6/1e4*	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	7.4	**1.9**	**1.9**	**2.1**	**2.1**	**2.7**	3.2	4.1	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	7.0	**2.2**	**2.2**	3.5	4.7	4.6	7.3	8.2	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	5.9	8.4	13	17	48	115	95	642	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	8.9	3.4	**2.9**	3.3	3.5	4.4	6.2	5.8	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	3.7	**1.2**	**0.71**	**0.82**	**0.96**	**1.2**	**1.1**	**1.5**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.1**	14	**2.5**	**1.2**	**1.6**	**1.6**	**1.9**	3.1	4.2	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1.1**	**2.2**	**1.5**	3.7	3.3	3.9	4.4	10	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	17	20	45	115	360	592	*16e-3/6e3*	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	24	37	13	5.0	6.1	14	49	226	555	6150	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.0**	5.4	**1.4**	**0.99**	**0.97**	**0.96**	**1.0**	**1.0**	**1.0**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.7**	**1.2**	**0.80**	**0.96**	**1.0**	**0.95**	**0.98**	**1.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**1.6**	3.3	5.3	7.2	7.2	7.2	7.2	7.0	CMA+DE-MOS [13]
NEWUOA	**1**	**1.1**	12	29	61	65	150	532	*57e-4/5e3*	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.6**	7.8	9.2	11	13	20	26	31	Basic RCGA [17]
SPSA	36	53	199	8554	13692	18097	13131	*11e-1/1e5*	.	.	SPSA [9]

Table 38: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{108} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	1.9	33	655	1842	3608	5060	5729	10727	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	34	29	53	*15e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	23	24	25	13	37	*84e-3/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	54	25	23	81	*10e-2/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	30	41	19	79	*88e-3/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.1**	30	**10**	6.0	38	*42e-3/1e4*	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	30	19	**5.9**	**14**	*18e-3/1e4*	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.1**	**10**	14	9.3	38	*38e-3/1e4*	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	35	20	8.6	77	*39e-3/1e4*	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.5**	121	82	126	*39e-2/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	1294	1758	2673	269	44	25	**17**	**25**	**44**	68	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	14	**8.4**	**1.8**	**1.1**	**0.96**	**0.80**	**1.1**	**0.81**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.1**	97	11	**1.3**	**1.0**	**0.89**	**0.92**	**1.1**	**1.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**1.6**	66	138	91	61	49	45	**29**	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	108	56	36	*41e-2/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**2.1**	**10**	24	20	22	33	129	*18e-4/5e4*	Basic RCGA [17]
SPSA	111	264	275	166	58	390	*28e-3/1e5*	.	.	.	SPSA [9]

Table 39: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{109} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	1.2	6.8	31	48	64	65	84	84	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	5.4	3.5	**2.0**	**1.9**	**2.8**	3.6	3.9	6.8	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	3.9	**2.9**	**1.3**	**1.6**	**1.7**	**2.3**	**2.4**	3.7	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	3.5	**1.8**	**0.83**	**0.96**	**1.1**	**1.4**	**1.5**	**2.4**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	8.9	7.6	**2.5**	3.1	3.5	4.5	6.1	8.3	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**2.4**	**1.9**	**0.92**	**1.1**	**1.2**	**1.8**	**1.7**	3.0	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	4.1	**2.0**	**1.1**	**1.2**	**1.3**	**1.8**	**1.7**	**2.6**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**2.1**	**1.3**	**0.66**	**0.72**	**0.72**	**0.99**	**0.94**	**1.3**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**2.2**	**1.6**	**0.75**	**0.84**	**0.90**	**1.2**	**1.2**	**1.8**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.5**	3.4	7.6	5.9	8.9	17	58	112	262	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	15	30	21	9.5	4.4	33	403	3363	*20e-5/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**2.6**	**2.6**	**1.3**	**1.4**	**1.6**	**2.0**	**2.1**	3.1	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	4.5	**2.3**	**1.2**	**1.3**	**1.7**	**2.3**	**2.4**	3.6	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**2.5**	6.1	4.2	5.6	6.4	10	12	16	CMA+DE-MOS [13]
NEWUOA	**1**	**1.3**	5.3	6.2	6.4	12	34	146	181	*17e-5/5e3*	NEWUOA [16]
Basic RCGA	**1**	**1.1**	3.4	11	11	14	20	27	33	51	Basic RCGA [17]
SPSA	37	157	448	231	1467	1620	3769	6888	*43e-4/1e5*	.	SPSA [9]

Table 40: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{110} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	1.4	8.4	19	307	2092	6819	11776	20403	20660	21190	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	16	11	10	**2.9**	**1.7**	**2.5**	13	*12e-3/1e4*	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	10	4.3	5.5	**1.3**	**1.4**	**1.0**	**1.7**	3.4	*19e-4/1e4*	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	4.4	4.2	3.6	**1.5**	**1.0**	**1.4**	**2.7**	3.3	*43e-4/1e4*	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	4.9	6.9	10	4.5	3.2	3.8	*17e-3/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	6.1	**2.1**	**1.9**	**2.7**	**1.8**	**2.5**	**2.8**	**2.2**	3.4	6.7	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**3.5**	6.5	6.2	**2.4**	**1.3**	**1.5**	3.7	**2.2**	7.0	*43e-4/1e4*	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	28	8.1	4.1	**1.3**	**1.1**	**1.2**	**1.7**	3.5	3.5	3.4	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.8**	**1.2**	**2.5**	**2.0**	**1.2**	**0.82**	**2.5**	7.0	*48e-4/1e4*	.	(1,4s)-CMA-ES [3]
avg NEWUOA	18	18	15	6.6	8.4	*34e-2/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	119	85	174	60	103	206	*20e-2/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.4**	**1.5**	**1.7**	**1.3**	**2.6**	**1.2**	**0.69**	**0.40**	**0.40**	**0.41**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	3.6	**1.7**	**2.1**	**1.7**	4.9	**2.6**	**1.6**	**0.99**	**0.99**	**0.99**	IPOP-CMA-ES [15]
CMA+DE-MOS	3.7	4.5	6.1	4.9	19	7.6	4.4	**2.6**	**2.6**	**2.6**	CMA+DE-MOS [13]
NEWUOA	23	20	24	9.0	4.3	11	*22e-2/5e3*	.	.	.	NEWUOA [16]
Basic RCGA	4.2	5.3	6.8	5.8	20	23	*94e-3/5e4*	.	.	.	Basic RCGA [17]
SPSA	251	123	1625	*35e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 41: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{111} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.4	17	58	1158	9991	25295	64938	2.00e5	4.76e5	4.91e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	17	19	24	128	*19e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	7.2	8.8	16	12	*98e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	24	11	21	16	*14e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	20	29	39	31	*29e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	6.4	6.6	**5.0**	3.9	**4.2**	*27e-2/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	8.3	10	5.8	**2.7**	**3.1**	*32e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	16	8.2	9.3	3.0	*35e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	19	7.6	12	11	*85e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	52	66	55	*45e-1/6e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	246	64	94	15	30	27	*13e-2/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	14	13	**5.0**	**0.86**	**4.2**	**10**	**4.7**	**1.8**	**0.88**	**0.90**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.3**	**2.1**	**2.3**	**0.95**	16	16	**6.4**	**2.1**	**0.89**	**0.89**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.0**	**2.0**	17	12	17	**12**	30	*98e-3/1e5*	.	.	CMA+DE-MOS [13]
NEWUOA	32	42	85	32	7.8	*74e-1/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.3**	**2.3**	12	3.2	4.5	**14**	**5.4**	*91e-3/5e4*	.	.	Basic RCGA [17]
SPSA	113	87	191	*16e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 42: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{112} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	1.4	7.2	10	113	523	826	950	993	1035	1178	ERT_{best}/D
(1,2)-CMA-ES	7.7	7.6	17	28	10	8.7	8.0	7.8	8.5	7.8	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**3.0**	**2.6**	3.3	5.8	**2.5**	**2.0**	**1.9**	**2.0**	**2.0**	**1.9**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	5.1	**2.2**	3.5	5.1	**1.7**	**1.4**	**1.4**	**1.4**	**1.4**	**1.3**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	4.5	4.4	8.7	27	12	16	17	21	31	28	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.9**	**1.4**	**2.2**	**1.3**	**0.95**	**0.88**	**0.88**	**0.93**	**0.93**	**0.89**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**3.0**	**1.3**	**2.3**	3.1	**1.1**	**0.90**	**0.87**	**0.87**	**0.86**	**0.83**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.9**	**1.2**	**1.9**	**2.1**	**0.76**	**0.58**	**0.56**	**0.56**	**0.56**	**0.52**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	3.1	**1.6**	**2.7**	4.6	**1.5**	**1.2**	**1.1**	**1.1**	**1.1**	**1.0**	(1,4s)-CMA-ES [3]
avg NEWUOA	**2.8**	**0.93**	**2.1**	**2.2**	**1.8**	10	85	*20e-3/6e3*	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	57	24	23	306	571	1699	*26e-2/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.0	**1.8**	3.8	**1.6**	**0.79**	**0.70**	**0.72**	**0.74**	**0.76**	**0.76**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	4.2	**2.3**	3.7	4.6	**1.8**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	3.4	4.0	10	**2.4**	**1.9**	**1.6**	**1.6**	**1.8**	**1.9**	**2.0**	CMA+DE-MOS [13]
NEWUOA	**2.0**	**0.89**	**1.3**	**1.7**	**1.4**	8.7	37	73	*44e-4/5e3*	.	NEWUOA [16]
Basic RCGA	**2.7**	3.6	11	18	72	93	365	713	*23e-3/5e4*	.	Basic RCGA [17]
SPSA	1314	1782	2830	12462	*29e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 43: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{113} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	1.1	8.8	42	649	1031	1079	1079	1079	1143	ERT_{best}/D
(1,2)-CMA-ES	**2.5**	11	6.6	11	**2.6**	6.0	11	11	11	15	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.4**	**1.3**	**2.6**	**4.1**	**0.84**	**2.9**	4.1	4.1	4.1	6.4	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.2**	**2.4**	8.6	7.4	**1.3**	**1.8**	7.3	7.3	7.3	13	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**2.7**	24	12	8.7	3.6	18	41	41	41	125	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.6**	**3.0**	4.2	4.9	**2.0**	**2.3**	3.5	3.5	3.5	3.8	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.1**	**2.5**	**1.1**	5.7	**1.9**	**2.6**	3.4	3.4	3.4	3.4	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.3**	4.4	6.3	4.9	**1.6**	**2.7**	**2.8**	**2.8**	**2.8**	**3.2**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.3**	**2.8**	**2.4**	**4.6**	**1.7**	**2.2**	3.3	3.3	3.3	5.8	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.6**	5.6	8.2	15	8.0	25	75	75	75	*57e-3/6e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	28	14	22	19	82	292	392	392	392	1280	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	20	8.4	**2.0**	7.7	**0.88**	**0.60**	**0.77**	**0.77**	**0.77**	**0.75**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.7**	**2.7**	**1.8**	6.6	**1.9**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.1**	**1.7**	**1.3**	**4.1**	3.4	3.4	3.5	3.5	3.5	3.5	CMA+DE-MOS [13]
NEWUOA	**1.5**	14	7.7	14	5.1	12	70	70	70	*74e-3/5e3*	NEWUOA [16]
Basic RCGA	**1.1**	**1.6**	**2.1**	11	19	39	38	38	38	38	Basic RCGA [17]
SPSA	40	24	18	1660	1007	1374	*71e-2/1e5*	.	.	.	SPSA [9]

Table 44: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{114} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.98	8.5	338	2093	6295	9441	9441	9441	10860	ERT_{best}/D
(1,2)-CMA-ES	**1.1**	5.1	34	11	21	*31e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.1**	8.2	17	6.9	21	*30e-2/1e4*	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.1**	63	32	22	23	*22e-2/1e4*	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1.1**	35	30	12	*52e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.3**	67	21	3.6	7.6	23	*11e-2/1e4*	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.8**	**2.2**	**6.7**	**2.5**	**5.7**	**10**	15	15	15	*83e-3/1e4*	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.8**	27	25	4.0	12	*16e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	17	14	19	6.4	10	*22e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	143	104	26	*11e-1/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	877	2294	553	127	148	*14e-2/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.4**	34	25	**1.4**	**0.88**	**0.61**	**0.42**	**0.42**	**0.42**	**0.39**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.1**	12	7.1	**2.4**	**1.6**	**0.81**	**0.60**	**0.60**	**0.60**	**0.59**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.1**	**1.9**	**1.9**	9.3	31	20	13	13	13	**14**	CMA+DE-MOS [13]
NEWUOA	**1**	50	71	31	*11e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.5**	**1.8**	**1.6**	8.0	12	14	**12**	**12**	**12**	20	Basic RCGA [17]
SPSA	271	204	223	63	685	*29e-2/1e5*	.	.	.	.	SPSA [9]

Table 45: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{115} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.93	4.0	39	198	280	297	297	297	415	ERT_{best}/D
(1,2)-CMA-ES	**1.7**	3.2	4.9	**2.7**	7.9	41	63	63	63	*54e-4/1e4*	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.5**	**2.1**	**1.7**	**2.1**	**2.8**	5.8	12	12	12	21	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.1**	**1.5**	**2.9**	**1.4**	**1.6**	5.0	13	13	13	39	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1.5**	3.8	4.3	3.4	3.4	23	50	50	50	169	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.5**	3.6	**2.9**	**1.4**	**1.6**	**2.8**	4.3	4.3	4.3	6.5	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.4**	**2.9**	**2.7**	**0.88**	**1.3**	**1.4**	3.4	3.4	3.4	4.1	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.1**	**1.4**	**2.1**	**1.2**	**0.87**	**1.4**	**1.6**	**1.6**	**1.6**	**2.1**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.1**	**1.9**	4.5	**1.9**	**1.6**	**2.5**	3.1	3.1	3.1	5.3	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.5**	3.1	**1.1**	**2.6**	4.9	19	45	45	45	59	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	24	17	20	122	392	1637	4763	4763	4763	3402	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.2**	**2.7**	**2.0**	**0.88**	**0.91**	**0.80**	**0.90**	**0.90**	**0.90**	**0.78**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.7**	3.2	6.4	**2.4**	**1.8**	**2.4**	**2.4**	**2.4**	**2.4**	**1.9**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.1**	**2.0**	**2.3**	**2.1**	5.0	7.4	7.6	7.6	7.6	5.6	CMA+DE-MOS [13]
NEWUOA	**2.4**	**2.8**	**0.96**	4.0	8.3	66	215	215	215	154	NEWUOA [16]
Basic RCGA	**1.1**	**0.95**	6.1	56	96	145	138	138	138	129	Basic RCGA [17]
SPSA	52	44	49	576	560	1532	*43e-3/1e5*	.	.	.	SPSA [9]

Table 46: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{116} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	6.2	25	56	881	1473	2051	2381	3153	3205	3790	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	14	14	17	9.4	96	*68e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	6.3	11	14	4.0	8.4	10	14	10	46	*54e-3/1e4*	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	11	12	27	5.6	6.8	34	*45e-3/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	14	36	40	13	46	34	63	*61e-2/1e4*	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.4**	**2.3**	12	3.8	11	15	18	15	15	19	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	4.6	**5.9**	10	3.1	4.3	4.9	5.4	7.6	14	12	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	11	8.9	11	**1.8**	4.0	4.5	5.5	7.9	10	*96e-5/1e4*	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	17	7.0	**8.2**	**2.2**	3.9	7.1	13	14	*18e-3/1e4*	.	(1,4s)-CMA-ES [3]
avg NEWUOA	19	24	65	28	*30e-1/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	1443	1318	1980	1701	*97e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	6.8	6.2	**5.9**	**1.3**	**1.2**	**1.0**	**0.90**	**0.71**	**0.71**	**0.63**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	4.5	7.4	11	**2.8**	**2.5**	**2.1**	**1.9**	**1.5**	**1.5**	**1.3**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.2**	**2.8**	**7.3**	4.4	**3.0**	**2.4**	**2.2**	**1.9**	**2.0**	**1.9**	CMA+DE-MOS [13]
NEWUOA	12	18	45	41	50	*49e-1/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**2.6**	18	61	26	52	65	*67e-3/5e4*	.	.	.	Basic RCGA [17]
SPSA	98	863	4071	1622	*20e+0/1e5*	.	.	.	.	.	SPSA [9]

Table 47: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{117} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	6.2	77	797	4787	13169	18816	20573	23466	24559	26680	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	43	13	16	30	*84e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	13	13	6.7	30	*56e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	12	7.8	13	10	*93e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	38	16	13	*95e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	13	6.8	5.2	14	*34e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	10	**4.6**	5.6	**6.7**	**3.5**	7.9	*18e-1/1e4*	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	32	6.9	**2.7**	*23e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	21	6.0	5.7	9.3	11	*22e-1/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	66	48	33	*44e+0/6e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	559	157	361	293	107	*20e+0/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**10**	**2.7**	**1.8**	**0.95**	**0.56**	**0.44**	**0.55**	**0.56**	**0.57**	**0.66**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	20	5.3	**2.3**	**1.0**	**0.66**	**0.66**	**0.64**	**0.60**	**0.62**	**0.68**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.2**	**3.3**	6.6	8.1	4.6	**6.0**	**7.0**	**6.2**	**6.0**	**5.6**	CMA+DE-MOS [13]
NEWUOA	46	27	96	*23e+0/5e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**2.7**	5.5	7.4	10	16	38	35	*57e-2/5e4*	.	.	Basic RCGA [17]
SPSA	314	120	133	*81e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 48: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{118} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	4.7	6.8	36	68	237	284	336	392	428	531	ERT_{best}/D
(1,2)-CMA-ES	11	18	9.4	15	7.2	6.5	6.1	5.8	5.6	6.5	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	4.1	8.8	4.2	7.5	3.4	3.4	3.3	**3.0**	3.0	**2.7**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	4.0	7.4	5.5	5.5	**2.0**	**1.8**	**2.0**	**1.9**	**1.8**	**1.6**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	6.9	13	30	46	23	24	27	23	21	20	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	4.1	6.5	**2.6**	3.2	**1.3**	**1.3**	**1.2**	**1.1**	**1.1**	**1.0**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.5**	6.8	3.2	3.5	**1.2**	**1.2**	**1.1**	**1.1**	**1.1**	**0.99**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.4**	**3.4**	**2.0**	**2.3**	**0.92**	**0.83**	**0.78**	**0.71**	**0.71**	**0.66**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.6**	6.0	3.3	**3.0**	**1.1**	**1.0**	**0.93**	**0.85**	**0.82**	**0.75**	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.98**	**1.4**	**1.0**	5.0	5.4	26	77	*43e-4/6e3*	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	38	81	715	2979	2747	4936	*21e-1/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.3	4.9	3.4	**3.0**	**1.0**	**0.98**	**0.95**	**0.89**	**0.94**	**0.94**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	4.3	7.9	6.2	6.7	**2.6**	**2.4**	**2.2**	**2.0**	**2.0**	**1.9**	IPOP-CMA-ES [15]
CMA+DE-MOS	3.3	10	6.0	5.2	**1.9**	**2.0**	**2.3**	**2.5**	**2.8**	3.1	CMA+DE-MOS [13]
NEWUOA	**1.3**	**1.4**	**1.7**	3.7	6.5	43	109	*19e-3/5e3*	.	.	NEWUOA [16]
Basic RCGA	**2.3**	78	142	542	672	1269	2227	*75e-2/5e4*	.	.	Basic RCGA [17]
SPSA	126	254	1406	6641	*41e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 49: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{119} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget ERT_{best}/D	1e+03 0.33	1e+02 0.33	1e+01 0.73	1e+00 22	1e-01 140	1e-02 203	1e-03 668	1e-04 1894	1e-05 4013	1e-07 5240	Δftarget ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.3**	6.6	4.3	5.3	17	48	*24e-4/1e4*	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	4.8	3.2	**1.7**	4.2	3.2	8.2	17	*14e-5/1e4*	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.1**	**2.2**	**1.5**	**1.4**	**2.9**	4.5	35	*18e-5/1e4*	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.1**	28	6.9	3.7	39	110	*50e-4/1e4*	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**2.1**	9.2	4.3	**1.5**	**3.0**	**2.4**	4.1	18	*63e-6/1e4*	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.3**	4.7	3.2	**0.92**	**1.5**	**2.3**	3.0	3.9	28	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.8**	12	**1.7**	**0.96**	**1.8**	**2.6**	**2.9**	6.1	*48e-6/1e4*	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	3.7	43	3.7	**2.0**	3.2	4.9	9.3	35	*18e-5/1e4*	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	23	8.2	16	51	*13e-3/6e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	24	36	25	24	25	136	193	367	*11e-4/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.1**	5.5	**1.1**	**0.55**	**0.92**	**0.77**	**0.87**	**0.72**	**0.79**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.9**	8.4	**0.93**	**0.38**	**0.69**	**0.91**	**1.2**	**1.0**	**1.7**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**1.2**	**1.2**	**2.6**	4.6	**2.1**	**1.0**	**0.68**	**1.0**	CMA+DE-MOS [13]
NEWUOA	**1**	**2.2**	13	18	27	116	114	*31e-3/5e3*	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.3**	**2.4**	6.6	6.2	7.6	9.3	8.9	24	*17e-6/5e4*	Basic RCGA [17]
SPSA	35	55	187	5891	10571	7294	*10e-1/1e5*	.	.	.	SPSA [9]

Table 50: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{120} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	0.73	27	601	2312	10645	25282	40067	88603	ERT_{best}/D
(1,2)-CMA-ES	**1**	41	43	31	31	*11e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	4.0	58	**7.8**	15	*54e-3/1e4*	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.1**	65	31	29	63	*14e-2/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.3**	22	37	28	29	*13e-2/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	3.1	9.0	11	13	62	*71e-3/1e4*	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.4**	27	12	**7.1**	*44e-3/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.7**	**5.3**	17	10	61	*31e-3/1e4*	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	54	18	14	*51e-3/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	24	120	66	40	*36e-2/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	779	1826	2111	847	151	74	43	58	*11e-3/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.2**	14	8.3	**1.9**	**1.6**	**0.66**	**0.49**	**0.57**	**0.50**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.3**	8.6	11	**1.9**	**0.97**	**0.60**	**0.54**	**0.53**	**0.77**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**1.2**	**3.5**	78	38	**15**	**10**	**10**	**4.4**	CMA+DE-MOS [13]
NEWUOA	**1**	**1.7**	120	62	62	*42e-2/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.5**	**3.0**	**5.5**	19	**26**	32	*85e-4/5e4*	.	.	Basic RCGA [17]
SPSA	99	281	549	247	338	*12e-2/1e5*	.	.	.	.	SPSA [9]

Table 51: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{121} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	0.73	14	39	83	233	500	766	1107	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.3**	**2.7**	**1.6**	**1.6**	**2.4**	3.1	**2.9**	3.9	5.3	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	3.0	**1.1**	**1.1**	**1.4**	**1.7**	**2.0**	**2.2**	**3.0**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1.9**	**1.1**	**1.1**	**0.88**	**1.1**	**1.4**	**1.4**	**1.8**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.6**	**2.6**	**2.7**	**2.8**	7.4	7.3	7.1	12	23	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.3**	**1.5**	**0.78**	**0.78**	**1.2**	**1.1**	**1.1**	**0.95**	**1.1**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.3**	3.9	**1.2**	**0.87**	**1.0**	**1.0**	**0.96**	**0.82**	**1.0**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.4**	**2.3**	**0.99**	**0.64**	**0.66**	**0.66**	**0.54**	**0.52**	**0.56**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.5**	4.6	**1.2**	**0.82**	**0.89**	**0.93**	**0.80**	**0.77**	**0.80**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.3**	**2.9**	3.5	5.3	27	319	*47e-4/5e3*	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	18	34	29	7.9	4.6	266	886	2818	*11e-4/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**2.8**	**1.1**	**0.92**	**1.0**	**0.90**	**0.80**	**0.87**	**0.90**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.1**	4.3	**1.3**	**1.2**	**1.5**	**1.6**	**1.7**	**1.9**	**2.6**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**1.2**	**1.4**	4.5	4.7	3.2	**2.4**	**2.3**	**2.6**	CMA+DE-MOS [13]
NEWUOA	**1**	**1.2**	3.2	3.6	7.7	43	*62e-4/5e3*	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.4**	**1.5**	**2.6**	13	11	37	43	161	*19e-6/5e4*	Basic RCGA [17]
SPSA	36	101	278	2723	3628	2262	6233	*24e-2/1e5*	.	.	SPSA [9]

Table 52: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{122} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	1.9	119	601	1439	2532	3458	4081	6336	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	5.3	7.0	6.8	53	*15e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.8**	5.1	**1.6**	5.0	24	*21e-3/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.3**	6.4	3.1	10	47	*35e-3/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.7**	10	5.2	56	*16e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.3**	6.1	3.5	6.1	47	*20e-3/1e4*	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	4.5	**1.9**	**3.6**	9.3	*85e-4/1e4*	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.3**	3.0	**0.74**	5.3	11	58	*18e-3/1e4*	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**2.3**	11	5.1	11	103	*61e-3/1e4*	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.1**	13	22	*37e-2/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	29	35	11	4.1	49	147	165	406	*52e-3/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.3**	**2.9**	**1.4**	**0.80**	**0.70**	**0.67**	**0.61**	**0.81**	**0.90**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.1**	**1.9**	**1.1**	**1.1**	**0.69**	**0.76**	**0.84**	**0.96**	**1.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.3**	**1.5**	**2.7**	9.2	15	15	17	**22**	**17**	CMA+DE-MOS [13]
NEWUOA	**1**	**1.1**	8.5	21	122	*65e-2/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.1**	**1.1**	**1.4**	7.9	13	**8.6**	**13**	**16**	87	*67e-6/5e4*	Basic RCGA [17]
SPSA	69	158	103	2636	*20e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 53: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{123} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.33	0.33	1.6	515	7277	16727	31053	43067	63620	1.47e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	5.9	29	11	*73e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**2.3**	34	7.4	*62e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	20	48	5.0	*65e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.2**	49	15	*90e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.5**	27	7.2	19	*34e-2/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.4**	**4.6**	**3.1**	*32e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.4**	30	5.2	*45e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	37	82	10	*59e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	12	118	33	*16e-1/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	374	549	697	46	**17**	89	*75e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.1**	25	**2.9**	**0.56**	**0.71**	**0.75**	**0.75**	**0.84**	**0.92**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.4**	8.5	**1.7**	**0.90**	**0.98**	**0.89**	**0.82**	**0.85**	**1.2**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.3**	**1.8**	171	51	**22**	**16**	**16**	**11**	**4.8**	CMA+DE-MOS [13]
NEWUOA	**1**	12	132	20	*12e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.2**	**2.2**	13	47	*36e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	64	46353	22910	1289	*14e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 54: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{124} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.33	0.33	1.2	65	309	1139	2364	3098	4301	4961	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1.4**	43	7.4	34	*82e-3/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.5**	**2.3**	**0.46**	**2.7**	4.1	60	*70e-4/1e4*	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.6**	3.9	**2.2**	3.7	7.6	*73e-4/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.3**	6.4	10	78	*13e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.9**	34	17	8.5	11	60	*79e-4/1e4*	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.1**	**2.8**	**0.89**	**2.1**	**2.9**	6.5	46	*10e-4/1e4*	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.4**	3.7	**2.4**	**1.2**	**1.5**	**5.7**	*91e-5/1e4*	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**2.1**	22	**2.6**	4.2	5.5	63	*45e-4/1e4*	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.5**	11	7.7	59	*18e-2/5e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	15	24	16	6.2	30	103	*11e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.0**	4.2	**0.54**	**0.82**	**0.50**	**0.55**	**0.87**	**1.2**	**1.4**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.5**	3.2	**0.59**	**2.0**	**1.1**	**0.79**	**0.96**	**1.5**	**2.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.3**	**2.4**	**2.5**	27	10	5.8	**5.0**	**5.0**	**5.0**	CMA+DE-MOS [13]
NEWUOA	**1**	**1.5**	5.6	13	36	*14e-2/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.2**	**1.8**	4.5	22	11	18	50	170	*80e-5/5e4*	Basic RCGA [17]
SPSA	27	51	6155	2182	4845	*11e-1/1e5*	.	.	.	.	SPSA [9]

Table 55: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{125} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	0.33	0.33	0.33	1473	8226	11656	12117	12667	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1**	19	572	6.4	*69e-4/1e4*	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	**8.7**	**207**	3.9	18	13	*38e-4/1e4*	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	10	289	**2.8**	18	13	*53e-4/1e4*	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1.3**	11	791	5.8	*68e-4/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	**8.1**	677	4.8	8.6	*55e-4/1e4*	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	10	508	3.1	8.6	13	12	*31e-4/1e4*	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	**8.9**	298	**2.5**	4.0	13	*31e-4/1e4*	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	14	556	5.3	18	*69e-4/1e4*	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**1.4**	9.3	326	**1.6**	3.0	6.9	6.7	*40e-4/6e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	30	38	49	79	569	**1.8**	21	38	57	115	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.3**	9.5	289	**0.69**	**0.67**	**0.70**	**0.76**	**0.75**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.2**	11	**243**	**1.4**	**1.1**	**0.98**	**0.97**	**0.99**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	13	**222**	**1.8**	4.0	6.3	6.1	**5.9**	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.8**	10	332	**0.88**	**2.8**	**2.0**	**1.9**	*19e-4/5e3*	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.3**	9.3	291	**1.0**	5.2	8.1	59	*54e-5/5e4*	Basic RCGA [17]
SPSA	25	38	41	66	21710	14	*36e-4/1e5*	.	.	.	SPSA [9]

Table 56: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{126} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.33	0.33	0.33	0.33	0.33	4499	37712	1.11e5	2.08e5	3.20e5	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1.1**	135	3640	15	*26e-3/1e4*	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	87	3050	16	*22e-3/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	148	1434	7.1	*20e-3/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	209	5363	*38e-3/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1.2**	15	1230	10	*18e-3/1e4*	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	**11**	1618	3.4	*10e-3/1e4*	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	**6.5**	1116	7.3	*12e-3/1e4*	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	32	97	1584	5.4	*12e-3/1e4*	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**1.7**	258	6248	*49e-3/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	630	728	1797	2592	7997	8.5	4.1	6.1	*22e-4/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	74	933	**0.68**	**0.89**	**0.66**	**0.49**	**0.49**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	15	**645**	**0.85**	**0.88**	**0.81**	**0.95**	**0.91**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	16	**237**	**0.11**	15	*27e-4/1e5*	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	13	266	8605	17	*48e-3/5e3*	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	**7.1**	**350**	**0.31**	**0.65**	**1.1**	**3.5**	*15e-5/5e4*	Basic RCGA [17]
SPSA	18	46208	75111	2.01e5	3.07e5	159	*54e-3/1e5*	.	.	.	SPSA [9]

Table 57: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{127} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	0.33	0.33	0.33	1168	13028	15016	15116	15332	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1.3**	11	367	6.1	*76e-4/1e4*	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.1**	6.9	**184**	**2.1**	**1.8**	4.7	4.6	4.6	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	10	644	3.5	5.5	*54e-4/1e4*	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	12	644	7.3	11	*73e-4/1e4*	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	**4.8**	423	6.0	5.4	10	9.5	9.4	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1.1**	9.3	417	3.7	5.4	10	10	10	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	**4.7**	217	**1.5**	**2.2**	**2.0**	**2.0**	**1.9**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	13	204	4.5	**2.3**	4.5	4.5	4.4	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**2.1**	11	295	4.5	*61e-4/5e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	14	24	30	55	224	10	24	94	*17e-4/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	**6.4**	**179**	3.7	**1.2**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	14	**189**	4.3	**0.83**	**1.4**	**1.5**	**1.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	12	190	**0.19**	**1.9**	**2.7**	**2.7**	**2.8**	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.1**	18	278	**1.6**	**2.3**	4.3	4.2	*61e-4/4e3*	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	12	293	**1.1**	**2.3**	8.3	15	46	Basic RCGA [17]
SPSA	31	47	82	1530	45810	582	*22e-3/1e5*	.	.	.	SPSA [9]

Table 58: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{128} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	1.8	142	375	449	639	903	905	1447	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	4.7	3.7	**2.3**	4.7	4.7	6.8	7.1	7.7	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.9**	**1.6**	**2.3**	**2.5**	**1.8**	**1.4**	**1.7**	**1.1**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**2.3**	**2.9**	4.0	3.7	3.1	**2.3**	**2.6**	**1.9**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	3.5	3.1	3.4	5.7	5.0	3.9	3.9	4.3	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**2.6**	**2.7**	**2.4**	**2.5**	**1.8**	**1.3**	**1.3**	**0.91**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**2.0**	3.3	4.1	4.0	**2.8**	**2.4**	**2.4**	**1.9**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	3.6	3.1	3.1	**3.6**	**2.5**	**1.9**	**1.9**	**1.2**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**2.7**	3.1	4.8	4.8	3.7	**2.7**	**2.8**	**2.4**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	4.3	10	19	25	18	17	45	*45e-3/6e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	30	40	12	14	48	84	146	264	471	*90e-5/1e5*	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.2**	7.3	16	36	26	76	76	48	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**2.2**	7.3	12	11	15	11	11	7.3	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.3**	33	52	46	32	24	24	16	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**1.7**	7.0	9.1	14	35	84	*89e-4/5e3*	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.3**	18	33	58	49	35	43	41	Basic RCGA [17]
SPSA	20	31	150	1406	1931	3251	2283	*13e-1/1e5*	.	.	SPSA [9]

Table 59: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{129} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	1.6	121	1131	2617	3861	8261	9454	12845	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	53	15	5.2	54	*23e-3/1e4*	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	21	13	4.8	17	36	*61e-3/1e4*	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	31	18	7.9	18	38	*27e-3/1e4*	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	28	25	11	28	*90e-3/1e4*	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	14	14	**4.0**	5.7	**11**	18	15	*11e-3/1e4*	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	5.1	**7.3**	**3.2**	**5.3**	12	**8.5**	*47e-4/1e4*	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	10	11	**4.5**	6.2	37	*30e-3/1e4*	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	22	**11**	5.5	7.6	38	18	*14e-3/1e4*	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	51	34	12	15	21	**10**	*23e-2/6e3*	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	181	2286	6231	223	74	45	88	56	157	116	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.4**	**5.9**	5.0	**2.8**	**12**	**10**	**9.1**	**6.9**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	7.5	12	4.7	**3.3**	**6.1**	13	**11**	**22**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.4**	239	81	72	77	51	45	48	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	56	63	21	30	21	*79e-2/5e3*	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.6**	11	12	11	24	14	**13**	**27**	Basic RCGA [17]
SPSA	54	279	1008	171	308	271	*14e-2/1e5*	.	.	.	SPSA [9]

Table 60: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{130} in **03-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.33	0.33	1.8	82	172	305	501	2264	3981	4782	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**2.9**	38	43	24	15	3.4	**2.3**	**2.0**	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**2.7**	17	14	**7.9**	5.5	**1.2**	**0.71**	**0.60**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1.2**	8.1	**10**	10	5.9	**1.7**	**0.97**	**0.82**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	4.0	32	53	31	19	5.0	**2.8**	**2.4**	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	21	10	13	10	6.0	**1.3**	**0.76**	**0.64**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**2.1**	11	15	8.6	**5.2**	**1.2**	**0.67**	**0.56**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	14	8.5	**7.6**	**5.2**	**3.2**	**0.70**	**0.40**	**0.34**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**2.4**	**7.7**	15	**8.4**	**5.2**	**1.1**	**0.65**	**0.55**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**2.6**	**3.9**	12	8.5	11	5.6	5.7	*90e-5/5e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	22	37	12	54	155	216	204	131	104	*99e-5/1e5*	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**2.3**	19	46	51	57	35	20	17	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	3.1	53	57	33	153	34	19	16	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.8**	90	332	398	389	86	87	73	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.0**	**3.0**	**9.4**	18	21	6.6	17	*86e-4/5e3*	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.3**	15	84	132	139	31	23	26	Basic RCGA [17]
SPSA	15	30	103	523	486	574	1367	648	369	*51e-3/1e5*	SPSA [9]

Table 61: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{101} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	2.2	7.4	8.8	10	12	13	14	15	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.2**	8.3	4.4	6.3	8.1	8.5	10	11	13	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	3.1	4.3	3.3	4.9	6.0	5.8	6.6	7.4	8.9	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	3.8	**2.9**	4.1	5.0	5.1	5.8	6.7	7.7	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	7.0	4.7	6.7	8.0	7.6	8.7	10	12	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**2.8**	**2.8**	3.6	4.5	4.6	5.5	6.1	7.1	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.3**	**2.4**	**2.1**	**2.8**	4.0	4.1	4.5	5.1	6.4	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.2**	**2.4**	**1.7**	**2.3**	**2.9**	**3.0**	**3.5**	**3.9**	**4.6**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	3.3	**2.7**	**2.1**	**2.7**	3.5	3.5	4.0	4.4	5.3	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.6**	**2.9**	**1.5**	**1.6**	**1.7**	**1.5**	**1.5**	**1.5**	**1.5**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	41	61	22	13	14	17	16	18	20	24	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.2**	**3.0**	**3.0**	4.2	5.8	5.8	6.7	7.6	9.3	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.2**	3.3	3.4	4.7	6.0	6.0	6.9	7.8	9.3	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	7.3	12	19	23	24	27	31	37	CMA+DE-MOS [13]
NEWUOA	**1**	3.6	**2.5**	**1.6**	**2.1**	**2.5**	**2.6**	**2.9**	**3.0**	**3.1**	NEWUOA [16]
Basic RCGA	**1**	**1.1**	7.7	25	48	88	113	155	206	293	Basic RCGA [17]
SPSA	40	64	83	171	386	434	455	494	568	9667	SPSA [9]

Table 62: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{102} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	2.2	7.1	10	13	14	16	17	20	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.4**	9.2	5.8	6.2	6.5	7.7	9.1	10	11	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.4**	3.9	3.3	3.6	4.2	4.9	5.4	6.0	6.8	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**2.4**	4.2	3.3	3.9	3.9	4.7	5.1	5.4	6.3	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**2.3**	4.1	5.2	6.4	6.6	8.0	8.6	9.3	10	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	3.2	**2.5**	**2.9**	**3.0**	3.7	4.2	4.6	5.3	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.7**	**2.4**	**2.4**	**2.7**	**2.7**	3.4	3.9	4.1	4.5	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**2.3**	**1.7**	**2.1**	**2.3**	**2.7**	**3.0**	**3.2**	**3.7**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.6**	**2.8**	**2.1**	**2.4**	**2.7**	**3.2**	**3.4**	**3.6**	**4.4**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.3**	**2.7**	**1.4**	**1.5**	**1.4**	**1.5**	**1.5**	**1.6**	**1.5**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	45	79	21	14	14	14	16	18	18	20	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.4**	3.5	3.4	3.8	4.3	5.0	5.8	6.1	7.0	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.5**	3.4	3.1	4.1	4.2	5.1	6.0	6.5	7.3	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	5.7	12	17	18	20	22	25	27	CMA+DE-MOS [13]
NEWUOA	**1**	3.9	6.3	6.0	7.0	15	20	27	33	41	NEWUOA [16]
Basic RCGA	**1**	**1.2**	10	29	39	57	88	123	155	209	Basic RCGA [17]
SPSA	41	60	1987	4868	9895	9681	9199	11030	24495	*31e-3/1e5*	SPSA [9]

Table 63: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{103} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	2.2	5.5	6.0	6.0	6.3	6.4	7.0	23	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.5**	6.2	6.7	9.0	13	18	22	25	10	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**2.5**	3.4	3.8	5.5	8.4	10	13	15	6.1	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	3.8	3.6	5.4	7.5	9.4	12	13	5.4	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**2.1**	8.2	7.0	10	12	16	20	22	9.2	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.6**	**2.1**	3.0	**4.4**	6.5	8.5	10	12	5.0	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.3**	**2.6**	**2.8**	4.6	**6.3**	**7.8**	**10**	**11**	**4.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.2**	**2.4**	**2.1**	**3.5**	**4.9**	**6.1**	**7.5**	**8.1**	**3.4**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.6**	**2.9**	**2.9**	4.8	6.7	**8.0**	**10**	**10**	**4.2**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.5**	**2.5**	**1.6**	**3.6**	**5.4**	13	26	42	34	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	32	57	20	15	20	27	30	37	42	20	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**2.9**	4.1	6.3	8.8	11	14	16	6.5	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.4**	3.6	4.0	6.6	9.4	12	15	17	7.1	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	7.6	13	28	38	48	60	72	30	CMA+DE-MOS [13]
NEWUOA	**1**	3.5	**2.4**	**1.9**	5.7	9.4	60	85	178	136	NEWUOA [16]
Basic RCGA	**1**	**1.3**	7.1	27	60	133	234	353	434	222	Basic RCGA [17]
SPSA	51	202	151	119	165	251	415	5261	93276	*42e-6/1e5*	SPSA [9]

Table 64: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{104} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	3.8	11	35	155	257	315	354	385	408	457	ERT_{best}/D
(1,2)-CMA-ES	7.1	7.7	3.9	13	54	222	*98e-3/1e4*	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.9**	8.2	3.3	4.3	13	14	13	13	12	11	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3.2	**2.9**	**1.6**	9.3	14	24	24	22	21	18	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	4.0	8.0	3.5	13	50	98	410	*69e-3/1e4*	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.0**	3.7	**1.6**	4.2	4.9	4.2	6.6	6.1	5.8	5.3	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.3**	3.4	**1.5**	5.0	**3.3**	3.9	3.6	3.3	3.2	**2.9**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.1**	3.1	**1.3**	4.3	5.0	4.2	3.8	3.5	3.3	3.0	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.6**	**2.7**	**1.3**	8.9	14	18	16	15	14	13	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.3**	**2.8**	**1.0**	5.0	7.6	14	23	21	20	24	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	22	13	5.5	583	448	367	327	300	284	254	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.2	**2.7**	**1.5**	**2.0**	**1.7**	**1.6**	**1.6**	**1.5**	**1.5**	**1.4**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.1**	**2.2**	**1.4**	**3.4**	**2.9**	**2.8**	**2.7**	**2.6**	**2.5**	**2.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	6.0	8.4	5.1	4.0	3.6	**3.3**	**3.2**	**3.0**	**3.0**	**2.9**	CMA+DE-MOS [13]
NEWUOA	**1.1**	**2.8**	**1.2**	**3.4**	6.0	14	24	100	*14e-4/5e3*	.	NEWUOA [16]
Basic RCGA	7.1	7.8	10	381	432	1080	963	1891	*12e-1/5e4*	.	Basic RCGA [17]
SPSA	189	148	*36e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 65: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{105} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.6	12	33	287	1035	2000	2078	2129	2165	2240	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	8.3	4.9	3.1	7.8	19	35	70	69	*18e-2/1e4*	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	4.5	3.8	**2.1**	6.0	10	10	20	*88e-3/1e4*	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3.4	4.4	**2.1**	3.5	5.0	23	*38e-3/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	6.6	3.5	4.9	10	19	*14e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	3.6	6.0	**2.8**	12	14	16	34	70	*14e-2/1e4*	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.4**	6.0	**2.6**	5.9	12	21	34	33	67	64	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.5**	**1.8**	**1.0**	4.3	8.7	23	69	67	66	64	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.7**	**1.5**	**1.6**	6.6	16	22	70	68	*12e-2/1e4*	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.3**	3.7	**1.7**	**2.4**	**1.9**	4.4	14	47	46	*45e-4/7e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	20	12	5.7	989	1355	702	675	659	648	626	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.8**	5.3	**2.8**	**3.0**	**1.3**	**0.71**	**0.70**	**0.70**	**0.70**	**0.70**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.3**	**2.7**	**1.6**	3.8	**1.6**	**0.89**	**0.90**	**0.90**	**0.90**	**0.90**	IPOP-CMA-ES [15]
CMA+DE-MOS	6.3	6.9	4.8	5.9	**2.2**	**1.3**	**1.5**	**1.6**	**1.6**	**1.6**	CMA+DE-MOS [13]
NEWUOA	**0.91**	**2.8**	**1.7**	**2.7**	3.3	5.0	*38e-3/5e3*	.	.	.	NEWUOA [16]
Basic RCGA	8.4	11	13	106	121	183	177	*51e-2/5e4*	.	.	Basic RCGA [17]
SPSA	499	250	*36e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 66: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{106} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	3.6	14	18	106	210	354	533	556	577	617	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	5.4	7.0	7.0	13	8.6	5.7	4.1	4.0	3.9	3.8	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	4.4	3.8	4.0	3.1	**2.5**	**1.8**	**1.3**	**1.3**	**1.3**	**1.3**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**2.2**	**2.4**	3.2	3.2	**2.4**	**1.7**	**1.2**	**1.2**	**1.2**	**1.2**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	7.1	6.6	7.9	8.5	6.8	4.7	3.4	3.4	3.4	3.4	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.3**	**2.4**	**2.7**	3.6	**2.4**	**1.6**	**1.2**	**1.2**	**1.1**	**1.1**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.8**	**1.3**	**2.0**	**2.8**	**2.0**	**1.4**	**0.96**	**0.96**	**0.96**	**0.95**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.6**	**0.92**	**1.3**	**2.0**	**1.4**	**0.96**	**0.68**	**0.68**	**0.68**	**0.67**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.4**	**1.2**	**2.1**	**1.8**	**1.5**	**1.0**	**0.74**	**0.74**	**0.74**	**0.73**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.9**	**0.85**	**0.85**	**1.5**	**2.4**	5.8	9.1	30	200	*21e-5/8e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	16	7.9	8.4	7.5	4.9	22	15	15	14	14	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.0**	**1.7**	**2.3**	**1.9**	**1.6**	**1.2**	**0.87**	**0.89**	**0.90**	**0.92**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.1**	**2.1**	3.1	**2.5**	**2.2**	**1.7**	**1.2**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES [15]
CMA+DE-MOS	5.9	4.6	8.3	5.3	4.0	**2.8**	**2.0**	**2.1**	**2.2**	**2.3**	CMA+DE-MOS [13]
NEWUOA	**1.1**	**0.73**	**0.93**	**2.2**	5.0	27	59	*79e-4/7e3*	.	.	NEWUOA [16]
Basic RCGA	7.6	7.2	21	363	476	490	662	*44e-2/5e4*	.	.	Basic RCGA [17]
SPSA	609	1375	2049	*26e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 67: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{107} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.20	0.20	8.0	46	91	138	188	234	275	370	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.3**	17	43	329	*18e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	3.8	7.7	6.7	28	76	315	*91e-5/1e4*	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	6.3	7.7	21	44	141	292	527	*17e-4/1e4*	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	12	44	451	*23e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.9**	13	8.9	13	24	57	109	*62e-5/1e4*	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	3.3	6.4	6.9	5.3	**7.1**	13	**14**	28	392	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	5.1	4.8	5.2	8.4	**12**	26	70	392	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.1**	14	10	26	80	123	605	*66e-4/1e4*	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.7**	68	317	*14e-1/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	52	72	4.7	**2.5**	**4.9**	11	50	124	272	1086	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.2**	**1.9**	**2.8**	**1.9**	**1.6**	**1.4**	**1.4**	**1.3**	**1.4**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**2.0**	**2.1**	**0.98**	**1.1**	**1.3**	**1.3**	**1.2**	**1.2**	**1.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	3.1	24	20	17	18	19	19	18	CMA+DE-MOS [13]
NEWUOA	**1**	**2.7**	60	194	*17e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.5**	**1.6**	10	10	11	13	15	**17**	**17**	Basic RCGA [17]
SPSA	50	82	8500	*88e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 68: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{108} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.20	0.20	17	1029	2894	4930	6187	8237	11726	16133	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.7**	43	*23e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**2.7**	27	22	*18e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.1**	32	44	*19e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**2.8**	90	69	*22e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.7**	**5.9**	15	51	*11e-1/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.4**	25	**7.7**	*84e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	3.7	15	13	*94e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**2.7**	25	69	*15e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	3.0	155	44	*27e-1/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	5825	9728	290	14	**7.8**	**7.2**	**8.6**	**10**	**13**	**46**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	12	11	**0.68**	**0.64**	**0.64**	**0.64**	**0.75**	**0.66**	**0.94**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.7**	9.1	**0.80**	**0.67**	**0.64**	**0.77**	**0.70**	**0.62**	**0.69**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**2.5**	95	125	157	267	201	141	*89e-2/1e5*	CMA+DE-MOS [13]
NEWUOA	**1**	48	77	64	*41e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**0.79**	13	30	70	*16e-2/5e4*	.	.	.	Basic RCGA [17]
SPSA	436	1305	89	10	242	*15e-2/1e5*	.	.	.	.	SPSA [9]

Table 69: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{109} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	2.2	11	43	75	114	139	175	189	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**2.7**	5.5	**2.8**	**1.8**	**1.9**	**1.9**	**2.5**	**2.5**	3.4	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	3.3	4.1	**2.5**	**1.2**	**1.1**	**1.0**	**1.1**	**1.0**	**1.3**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.3**	3.4	**2.1**	**1.0**	**0.86**	**0.77**	**0.89**	**0.89**	**1.1**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	5.8	3.5	**2.0**	**2.0**	**2.2**	**2.4**	**2.4**	3.4	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.1**	3.4	**2.2**	**1.0**	**0.98**	**1.0**	**1.1**	**1.1**	**1.4**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**2.9**	**1.4**	**0.79**	**0.82**	**0.81**	**0.88**	**0.93**	**1.2**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.6**	**1.9**	**1.1**	**0.57**	**0.52**	**0.50**	**0.53**	**0.52**	**0.67**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.2**	**3.0**	**1.3**	**0.79**	**0.76**	**0.68**	**0.68**	**0.66**	**0.88**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.5**	4.3	3.6	26	47	*67e-4/6e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	41	62	21	8.3	3.1	110	2422	*17e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.1**	3.1	**1.9**	**1.1**	**1.0**	**0.92**	**1.1**	**1.2**	**1.5**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**2.9**	**2.2**	**1.2**	**1.1**	**1.0**	**1.1**	**1.1**	**1.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	6.1	8.7	4.9	4.9	4.7	5.2	5.3	7.4	CMA+DE-MOS [13]
NEWUOA	**1**	**1.7**	4.8	13	83	885	*41e-3/5e3*	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.3**	9.0	20	12	14	16	20	25	53	Basic RCGA [17]
SPSA	50	101	138	953	3515	*13e-2/1e5*	.	.	.	.	SPSA [9]

Table 70: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{110} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	10	48	190	6725	24004	1.12e5	1.19e5	1.19e5	1.21e5	1.22e5	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	18	8.0	32	*69e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	3.1	3.9	3.4	**2.3**	**2.8**	**0.61**	*10e-1/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	6.2	3.2	**2.1**	**1.5**	**2.9**	**1.3**	*67e-2/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	26	21	46	*92e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	8.3	5.0	**3.0**	**1.3**	6.0	**1.3**	*74e-2/1e4*	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	4.5	3.6	**1.5**	**0.66**	**1.0**	**1.3**	*37e-2/1e4*	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.6**	**2.0**	**1.6**	**1.1**	**1.0**	**1.3**	*28e-2/1e4*	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	3.8	**2.4**	3.6	**1.6**	**2.8**	*79e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	20	34	241	*27e+0/6e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	62	37	13	*33e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.1**	**1.1**	**0.54**	4.3	3.2	**0.82**	**0.79**	**0.79**	**0.79**	**0.79**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.81**	**0.65**	**0.73**	8.3	3.4	**0.75**	**0.72**	**0.73**	**0.73**	**0.74**	IPOP-CMA-ES [15]
CMA+DE-MOS	3.1	4.6	10	36	65	14	**13**	**13**	**13**	**13**	CMA+DE-MOS [13]
NEWUOA	17	23	118	10	*13e+0/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**2.3**	3.1	4.8	35	30	6.5	*18e-1/5e4*	.	.	.	Basic RCGA [17]
SPSA	92	288	7418	*31e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 71: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{111} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	14	214	1371	1.22e5	1.77e6	4.59e6	4.61e6	4.62e6	6.20e6	6.26e6	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	48	115	*12e+1/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	27	26	*71e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	45	35	*72e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	64	81	*10e+1/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	23	11	54	*20e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	10	8.2	22	*18e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	12	11	30	*22e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	23	22	104	*42e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	142	60	*20e+1/6e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	121	39	22	12	*36e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**3.6**	**1.6**	**0.54**	**7.3**	**7.9**	*88e-2/1e6*	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.5**	**1.1**	**0.78**	15	**3.9**	**3.2**	**3.2**	**3.2**	**2.4**	**2.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	6.5	34	16	**2.8**	**0.89**	*20e-1/1e5*	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	78	97	*36e+1/5e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**2.8**	**2.6**	**2.4**	**6.0**	*26e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	79	60	1064	*20e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 72: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{112} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	3.6	14	21	337	684	832	900	963	1026	1119	ERT_{best}/D
(1,2)-CMA-ES	4.7	8.9	8.0	9.3	7.0	7.8	7.8	7.7	7.4	7.1	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.8**	**2.1**	**2.2**	**2.7**	**2.1**	**2.0**	**2.1**	**2.0**	**2.0**	**1.9**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3.6	**3.0**	**2.7**	**1.7**	**1.4**	**1.3**	**1.3**	**1.3**	**1.3**	**1.2**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	10	6.5	6.4	8.6	11	11	14	14	13	12	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.4**	**1.8**	**1.8**	**2.4**	**1.8**	**1.7**	**1.7**	**1.7**	**1.6**	**1.6**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.7**	**1.9**	**2.0**	**1.2**	**1.0**	**1.0**	**1.1**	**1.0**	**1.0**	**1.0**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.0**	**2.3**	**2.1**	**1.1**	**0.81**	**0.76**	**0.76**	**0.74**	**0.72**	**0.70**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.6**	**1.8**	**1.8**	**1.5**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.0**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.4**	**1.8**	3.1	4.9	23	110	*14e-2/7e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	22	7.7	7.1	828	962	*20e-1/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.9**	**2.0**	**2.2**	**1.2**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.9**	**2.0**	**2.1**	**1.4**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	6.3	4.9	7.3	**2.6**	**2.2**	**2.3**	**2.4**	**2.5**	**2.5**	**2.7**	CMA+DE-MOS [13]
NEWUOA	**0.94**	**0.71**	**1.9**	7.7	105	*44e-2/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	7.6	8.1	25	130	174	859	*70e-2/5e4*	.	.	.	Basic RCGA [17]
SPSA	331	364	1070	*45e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 73: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{113} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.20	1.9	27	377	1616	4804	4826	4826	4826	4880	ERT_{best}/D
(1,2)-CMA-ES	4.4	24	20	51	*11e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.9**	15	7.1	3.1	13	31	*12e-2/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.1**	6.3	6.1	3.4	26	30	*18e-2/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1.1**	17	21	37	*91e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.4**	6.2	8.8	3.3	11	14	29	29	29	*19e-2/1e4*	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.3**	4.7	**4.5**	**2.8**	**4.9**	14	14	14	14	14	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.8**	**1.9**	6.7	4.0	8.2	14	14	14	14	14	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	16	6.0	6.4	10	15	15	15	15	15	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.7**	23	14	31	55	*13e-1/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	67	13	19	132	251	*58e-2/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.9**	4.7	**4.4**	**0.78**	**0.77**	**0.27**	**0.32**	**0.32**	**0.32**	**0.32**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.4**	**2.0**	**3.7**	**1.4**	**1.4**	**0.61**	**0.67**	**0.67**	**0.67**	**0.67**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.5**	**1.8**	26	12	7.5	**3.6**	**4.0**	**4.0**	**4.0**	**4.2**	CMA+DE-MOS [13]
NEWUOA	**2.1**	15	13	44	*18e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.7**	**1.9**	10	22	23	18	35	35	35	48	Basic RCGA [17]
SPSA	72	23	1892	*56e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 74: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{114} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	2.3	153	2944	11262	15778	16654	16654	16654	16990	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1.3**	144	101	*11e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.5**	87	25	*63e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.3**	139	54	*79e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	38	56	56	*73e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.3**	55	18	*46e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.3**	**17**	14	*30e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	53	26	19	50	*21e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.4**	23	21	*53e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.3**	112	74	*11e+0/6e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	1787	721	152	61	*19e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.3**	35	**3.3**	**0.61**	**0.49**	**0.62**	**0.60**	**0.60**	**0.60**	**0.61**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.3**	41	**3.2**	**0.45**	**0.48**	**0.80**	**0.79**	**0.79**	**0.79**	**0.80**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.5**	**2.5**	60	130	34	**33**	**48**	**48**	**48**	**47**	CMA+DE-MOS [13]
NEWUOA	**1**	150	43	*89e-1/5e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.2**	**1.2**	**12**	**16**	**31**	*41e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	1025	531	181	245	*29e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 75: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{115} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.20	2.0	13	97	366	455	510	510	510	594	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**2.2**	3.8	5.3	5.7	66	*13e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.7**	**2.5**	**1.9**	**2.4**	6.6	54	137	137	137	240	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**2.9**	**3.0**	**2.3**	**1.6**	7.5	44	88	88	88	247	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1.3**	3.1	4.7	11	50	*17e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.9**	**1.7**	**1.7**	**1.7**	5.5	23	134	134	134	119	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.6**	**1.4**	**1.2**	**1.3**	**2.6**	**13**	26	26	26	70	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.7**	**1.4**	**2.9**	**1.7**	4.6	26	49	49	49	55	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.7**	**1.6**	**1.9**	**1.8**	6.9	45	89	89	89	*11e-3/1e4*	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.1**	**1.6**	**1.1**	4.2	28	*10e-2/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	63	13	8.6	422	1803	3116	2779	2779	2779	*31e-2/1e5*	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.2**	**2.0**	**1.8**	**0.81**	**1.1**	**1.1**	**1.4**	**1.4**	**1.4**	**1.5**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.3**	**1.2**	**1.7**	**2.4**	**2.7**	**2.9**	**3.1**	**3.1**	**3.1**	**2.7**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.5**	**2.5**	5.3	18	31	25	**23**	**23**	**23**	**20**	CMA+DE-MOS [13]
NEWUOA	**2.1**	**1.2**	**2.9**	14	42	*34e-2/4e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.4**	**1.7**	74	68	108	769	703	703	703	604	Basic RCGA [17]
SPSA	58	64	222	1640	3866	*12e-1/1e5*	.	.	.	.	SPSA [9]

Table 76: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{116} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	23	268	1146	2894	4462	5249	5374	5521	6066	6332	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	30	22	*42e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	8.2	5.0	8.0	16	*37e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	10	8.3	27	50	*17e+0/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	40	36	126	*72e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	7.2	5.3	6.6	15	*57e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	5.0	**2.8**	**3.9**	11	*33e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	6.0	4.2	4.0	**6.0**	32	27	27	*28e-1/1e4*	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	9.2	5.6	10	*86e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	29	35	*95e+0/6e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	565	5262	*33e+1/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.7**	**1.1**	**0.88**	**0.62**	**0.57**	**0.59**	**0.73**	**0.73**	**0.68**	**0.68**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**3.7**	3.8	**3.1**	**2.3**	**1.9**	**1.7**	**1.8**	**1.8**	**1.7**	**1.7**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.1**	**1.4**	8.3	6.1	**4.9**	**5.3**	**5.2**	**5.1**	**4.7**	**4.5**	CMA+DE-MOS [13]
NEWUOA	27	20	*74e+0/5e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	4.4	20	29	55	161	*22e-1/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	2007	5359	*74e+1/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 77: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{117} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	34	865	5337	15210	21947	25722	27362	30258	34557	38341	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	92	82	*32e+1/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	28	49	*19e+1/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	45	170	*31e+1/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	103	167	*31e+1/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	11	28	*13e+1/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	13	**10**	*82e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	12	35	*13e+1/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	21	24	*14e+1/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	38	100	*30e+1/6e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	721	308	135	*14e+1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	8.1	**1.8**	**0.65**	**0.48**	**0.44**	**0.44**	**0.47**	**0.45**	**0.43**	**0.46**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**6.5**	**1.5**	**1.1**	**0.95**	**0.77**	**0.70**	**0.73**	**0.71**	**0.67**	**0.69**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.8**	28	15	**8.5**	**8.8**	**7.6**	**7.2**	**6.5**	**6.7**	**6.1**	CMA+DE-MOS [13]
NEWUOA	41	*41e+1/5e3*	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**4.9**	10	**12**	48	*45e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	629	226	*13e+1/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 78: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{118} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	6.6	11	86	243	311	355	400	441	486	583	ERT_{best}/D
(1,2)-CMA-ES	6.1	15	9.2	6.5	6.4	7.3	7.8	7.9	8.2	8.8	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	6.1	10	4.6	**2.4**	**2.2**	**2.2**	**2.2**	**2.0**	**2.0**	**1.8**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	5.0	7.2	**2.6**	**1.6**	**1.8**	**1.8**	**1.7**	**1.6**	**1.5**	**1.4**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	6.6	16	18	10	16	17	19	24	39	44	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	3.4	7.0	**2.3**	**1.4**	**1.3**	**1.4**	**1.3**	**1.3**	**1.3**	**1.2**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.6**	5.7	**2.0**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.0**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.0**	**4.1**	**1.1**	**0.71**	**0.77**	**0.78**	**0.75**	**0.73**	**0.70**	**0.65**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	3.6	7.2	**1.9**	**1.0**	**0.96**	**0.97**	**0.95**	**0.92**	**0.88**	**0.84**	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.92**	**0.97**	**1.8**	8.3	64	*18e-2/7e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	27	689	337	622	889	3954	*21e-1/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.5**	6.1	**1.7**	**0.88**	**0.91**	**0.91**	**0.91**	**0.92**	**0.91**	**0.90**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**3.0**	9.0	3.2	**2.0**	**1.9**	**2.0**	**2.0**	**1.9**	**1.9**	**1.7**	IPOP-CMA-ES [15]
CMA+DE-MOS	7.6	17	3.7	**1.8**	**1.7**	**1.8**	**2.1**	**2.3**	**2.5**	**2.8**	CMA+DE-MOS [13]
NEWUOA	**0.80**	**1.3**	4.3	10	116	*30e-2/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	5.4	520	495	1424	*45e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	46	255	2588	*18e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 79: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{119} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.20	0.20	2.3	131	227	473	2074	6191	7059	9949	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.1**	15	7.8	86	*12e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**2.5**	6.4	**2.5**	6.1	70	*16e-3/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**2.6**	5.0	**2.7**	15	67	*18e-3/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	11	34	10	626	*20e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.1**	10	**2.2**	11	29	*62e-4/1e4*	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.9**	15	**1.1**	**3.7**	**7.8**	22	23	*42e-4/1e4*	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**2.1**	8.9	**1.9**	5.6	13	68	*55e-4/1e4*	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	6.0	4.0	12	88	*23e-3/1e4*	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	3.4	19	23	*42e-2/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	62	92	14	9.3	26	129	99	*23e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.4**	**1.5**	**0.55**	**0.58**	**0.75**	**0.55**	**0.51**	**0.49**	**0.61**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.1**	**0.35**	**0.70**	**0.78**	**0.83**	**0.79**	**1.0**	**1.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.2**	**2.6**	50	33	22	6.6	**3.3**	**3.3**	**2.5**	CMA+DE-MOS [13]
NEWUOA	**1**	**1.7**	26	35	*90e-2/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.2**	**1.4**	6.3	11	8.2	**6.1**	20	*20e-5/5e4*	.	Basic RCGA [17]
SPSA	51	67	3075	*32e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 80: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{120} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	3.2	580	3740	6898	14488	35436	66660	1.10e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.5**	77	33	*14e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	34	46	79	40	*11e-1/1e4*	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.7**	34	26	*10e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	63	51	34	*14e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	11	36	16	*77e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**2.9**	13	**6.6**	*66e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	56	64	10	*69e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.9**	38	15	*83e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	42	94	49	*15e-1/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	1223	2182	675	85	33	24	49	*13e-3/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.3**	18	**0.76**	**0.65**	**0.82**	**0.83**	**0.53**	**0.43**	**0.66**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.1**	**6.0**	**1.6**	**0.68**	**0.73**	**0.69**	**0.46**	**0.55**	**0.83**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.2**	**2.5**	63	130	71	**34**	**22**	**24**	**15**	CMA+DE-MOS [13]
NEWUOA	**1**	34	130	55	*24e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.3**	**0.87**	17	**12**	**23**	*50e-3/5e4*	.	.	.	Basic RCGA [17]
SPSA	194	1082	276	165	*84e-2/1e5*	.	.	.	.	.	SPSA [9]

Table 81: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{121} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.20	0.20	1.7	22	55	107	317	525	774	1239	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1.3**	4.5	**2.9**	**1.9**	3.3	**2.9**	3.8	4.5	9.0	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.6**	**2.4**	**1.2**	**0.94**	**1.2**	**1.1**	**1.7**	**1.9**	**2.8**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.1**	**2.7**	**1.1**	**0.87**	**0.84**	**0.90**	**1.0**	**1.2**	**1.3**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	4.4	5.3	**2.9**	**2.2**	**2.8**	5.7	5.5	9.4	27	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**2.1**	**1.7**	**1.2**	**0.91**	**1.1**	**0.96**	**1.1**	**1.2**	**1.3**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.7**	3.4	**1.2**	**0.86**	**1.1**	**0.91**	**0.93**	**1.0**	**1.2**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.2**	**2.0**	**0.72**	**0.57**	**0.70**	**0.51**	**0.58**	**0.60**	**0.56**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	3.1	**2.6**	**0.98**	**0.75**	**0.86**	**0.62**	**0.70**	**0.77**	**0.80**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	3.3	4.3	3.3	45	788	*38e-3/6e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	46	62	16	4.3	**2.9**	482	4519	*55e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	3.3	3.0	**1.1**	**1.1**	**1.1**	**0.78**	**0.79**	**0.84**	**0.82**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.6**	**1.9**	**1.1**	**1.0**	**1.1**	**1.1**	**1.7**	**2.1**	**2.3**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.2**	3.5	4.9	4.0	4.0	**2.3**	**2.4**	**2.3**	**2.5**	CMA+DE-MOS [13]
NEWUOA	**1**	3.9	4.8	15	76	*86e-3/4e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.3**	**2.1**	11	11	11	30	1408	*22e-5/5e4*	.	Basic RCGA [17]
SPSA	42	74	119	6850	*11e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 82: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{122} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	2.0	345	1838	4316	6017	8140	10749	22299	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.2**	11	30	*80e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.1**	6.0	**4.7**	*34e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.4**	7.1	6.2	*57e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.1**	38	40	*96e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.1**	8.7	11	*53e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	5.3	5.2	*38e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	4.9	4.8	*35e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	20	12	*57e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.5**	6.1	34	*11e-1/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	33	46	13	7.1	28	81	*62e-3/3e4*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.1**	**2.9**	**1.4**	**0.71**	**0.53**	**0.48**	**0.42**	**0.66**	**0.58**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.3**	4.8	**0.94**	**0.44**	**0.51**	**0.56**	**0.57**	**0.68**	**0.67**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**1.8**	110	65	35	26	19	**15**	**10**	CMA+DE-MOS [13]
NEWUOA	**1**	**1.9**	14	91	*18e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.1**	**2.4**	8.0	**3.7**	**5.4**	**10**	**19**	*72e-5/5e4*	.	Basic RCGA [17]
SPSA	53	87	117	*46e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 83: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{123} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	2.2	3213	16301	45479	67138	90334	1.34e5	4.43e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1.1**	75	*28e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	61	44	*22e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.1**	75	*29e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	33	87	*26e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.2**	40	44	*15e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	9.1	39	**21**	*15e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	39	46	*18e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	69	46	*14e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.5**	80	*26e-1/6e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	1886	2342	1444	43	*14e-1/4e4*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.3**	28	**0.94**	**0.66**	**0.46**	**0.67**	**0.62**	**0.56**	**0.60**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.4**	**23**	**0.62**	**0.52**	**0.46**	**0.74**	**0.80**	**0.65**	**0.45**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**1.7**	71	**96**	*18e-1/1e5*	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1.3**	65	*37e-1/5e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.1**	**2.1**	30	*11e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	77217	77493	12178	*71e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 84: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{124} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.20	0.20	1.9	40	208	1795	4096	5279	9067	19040	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.1**	11	127	700	*52e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.1**	3.4	**2.7**	30	83	*65e-3/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.3**	4.3	5.5	22	*60e-3/1e4*	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1.8**	96	277	*88e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	3.1	**2.8**	21	119	*13e-2/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.1**	**2.4**	**2.5**	15	39	*41e-3/1e4*	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.3**	**1.8**	7.6	18	79	*46e-3/1e4*	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.7**	17	19	72	*10e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.1**	6.1	89	*63e-2/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	54	76	19	5.7	80	*44e-3/6e4*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.3**	**2.6**	**1.2**	**2.1**	**0.85**	**0.93**	**0.93**	**0.94**	**0.59**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.8**	**2.8**	**1.3**	**4.0**	**1.0**	**1.2**	**1.1**	**0.93**	**0.65**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	**1.7**	5.9	**15**	**3.5**	**2.4**	**2.2**	**3.3**	**1.9**	CMA+DE-MOS [13]
NEWUOA	**1**	**1.1**	**3.0**	158	*11e-1/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.1**	**2.4**	63	41	10	11	66	*55e-5/5e4*	.	Basic RCGA [17]
SPSA	59	96	516	16583	*39e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 85: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{125} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget ERT_{best}/D	1e+03 0.20	1e+02 0.20	1e+01 0.20	1e+00 0.20	1e-01 0.20	1e-02 25031	1e-03 47750	1e-04 48260	1e-05 48600	1e-07 49199	Δftarget ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1**	120	59424	*92e-3/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.3**	69	14809	*69e-3/1e4*	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	36	32993	*81e-3/1e4*	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	247	1.04e5	*11e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	**21**	12610	*58e-3/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	24	12571	*58e-3/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	**20**	12034	*54e-3/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	48	23166	*82e-3/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**2.0**	81	9966	*36e-3/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	49	65	70	153	3423	5.7	*10e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	26	3142	**0.75**	**0.53**	**0.56**	**0.57**	**0.57**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	27	**2599**	**0.79**	**0.78**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.2**	34	**810**	5.0	**16**	**16**	**16**	**16**	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	3.9	**15**	6088	**2.8**	*40e-3/5e3*	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	26	**1574**	**1.3**	*82e-4/5e4*	.	.	.	Basic RCGA [17]
SPSA	41	60	35786	35837	52690	56	*51e-3/1e5*	.	.	.	SPSA [9]

Table 86: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{126} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.20	0.20	0.20	0.20	0.20	1.75e5	∞	∞	∞	∞	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1.1**	2015	7.40e5	*25e-2/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	618	*22e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	719	*20e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	32	585	7.17e5	*26e-2/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	532	*15e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	356	2.33e5	*12e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	82	1.14e5	*12e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1.2**	282	3.57e5	*18e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	22	1636	4.54e5	*26e-2/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	1548	1777	5228	7914	99874	8.3	*23e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	**62**	**7882**	**1.4**	*51e-4/4e5*	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	63	10254	**1.2**	**1.21e7**	**1.87e7**	**1.88e7**	**1.89e7**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.2**	**34**	**568**	*23e-3/1e5*	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**1.2**	1053	3.47e5	*26e-2/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	**33**	**1409**	**0.59**	*11e-3/5e4*	.	.	.	Basic RCGA [17]
SPSA	1.00e6	2.00e6	3.25e6	3.25e6	7.17e6	*16e+2/1e5*	.	.	.	.	SPSA [9]

Table 87: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{127} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	0.20	0.20	0.20	25716	68336	77023	77898	79070	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	85	13853	5.8	*55e-3/1e4*	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	31	5212	**2.7**	*44e-3/1e4*	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	27	4508	5.8	*29e-3/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1.3**	60	37537	*64e-3/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	18	7947	*32e-3/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	17	3986	5.6	*24e-3/1e4*	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	24	7806	*42e-3/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	**17**	9717	5.7	*29e-3/1e4*	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**2.0**	18	5233	*53e-3/6e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	44	62	77	181	1992	3.6	*92e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.1**	30	3085	**0.65**	**0.50**	**0.45**	**0.46**	**0.46**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	**15**	**1542**	**0.69**	**0.58**	**0.63**	**0.64**	**0.65**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.2**	35	**656**	**0.96**	**4.6**	**20**	**20**	**19**	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.5**	**14**	7248	*62e-3/4e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	41	**991**	**1.8**	*95e-4/5e4*	.	.	.	Basic RCGA [17]
SPSA	45	56	122	21588	3.40e6	*15e-2/1e5*	.	.	.	.	SPSA [9]

Table 88: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{128} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	22	850	1562	2100	2489	2984	3443	4232	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	4.8	5.9	10	16	29	24	*80e-3/1e4*	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**2.1**	**1.7**	**2.1**	**1.9**	**1.8**	3.1	3.1	**2.9**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**2.2**	**1.8**	**2.0**	**2.3**	**2.2**	**1.8**	**2.1**	3.7	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	10	4.8	21	71	60	*31e-2/1e4*	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	3.1	**2.8**	**2.9**	**2.5**	3.6	3.9	4.6	7.4	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1.9**	**2.7**	**1.6**	**1.9**	**1.8**	**1.6**	**1.5**	**1.6**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	3.4	**1.9**	**2.1**	**2.2**	**2.2**	**1.9**	**1.9**	**2.0**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	4.3	3.1	4.1	5.8	6.0	5.2	13	16	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	11	9.3	7.5	42	*31e-2/6e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	37	52	**2.5**	84	134	193	163	136	118	155	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**2.6**	**1.8**	47	35	30	25	22	18	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.0**	14	166	216	183	152	132	108	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.7**	58	108	81	68	57	50	41	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	12	17	43	*19e-1/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**0.69**	13	16	16	21	19	16	17	Basic RCGA [17]
SPSA	27	55	3631	*89e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 89: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{129} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.20	0.20	13	2142	11889	46274	56948	72928	1.02e5	1.16e5	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	168	*33e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	111	*34e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	120	22	*23e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	192	70	*56e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	32	**12**	**12**	*20e-1/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	28	21	*17e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	32	16	*19e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	37	15	**12**	**3.1**	*20e-1/1e4*	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	68	20	*30e-1/6e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	2252	4483	2336	116	120	31	25	20	14	12	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	11	**10**	16	8.7	**7.0**	**5.5**	**3.9**	**3.5**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**8.5**	13	18	**8.2**	**6.7**	**5.2**	**3.8**	**3.3**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**3.9**	68	42	16	13	10	7.5	6.6	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	124	16	*61e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**2.7**	**8.5**	**13**	**7.4**	**6.1**	**10**	**7.2**	**6.4**	Basic RCGA [17]
SPSA	626	2123	1131	*58e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 90: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{130} in **05-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.20	0.20	11	162	607	1640	6565	6746	6778	6906	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	14	48	23	10	**2.9**	**2.8**	**2.8**	3.6	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	7.2	17	8.7	**3.3**	**0.82**	**0.80**	**0.80**	**0.79**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	5.3	14	**5.1**	**1.9**	**0.47**	**0.46**	**0.46**	**0.46**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	37	58	41	15	3.8	3.7	3.8	3.8	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	5.4	25	12	4.5	**1.1**	**1.1**	**1.2**	**1.2**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1.0**	15	10	3.8	**0.95**	**0.93**	**0.93**	**0.92**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	6.8	**4.2**	**3.5**	**1.3**	**0.33**	**0.32**	**0.32**	**0.32**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	3.3	14	15	5.5	**1.4**	**1.3**	**1.3**	**1.3**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**1.3**	**6.4**	**5.9**	6.0	**3.0**	13	*14e-3/6e3*	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	35	57	5.2	203	146	124	104	102	*31e-3/1e5*	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.4**	143	391	145	36	35	35	35	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.2**	59	321	147	37	36	36	35	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**2.4**	295	221	121	30	29	29	29	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.3**	**11**	10	19	*62e-3/4e3*	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**2.5**	250	74	29	7.5	9.2	9.3	10	Basic RCGA [17]
SPSA	40	62	142	1955	*19e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 91: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{101} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	2.6	4.0	18	19	19	20	21	23	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	50	13	14	4.3	5.1	6.0	6.7	7.4	8.8	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	14	7.1	7.8	**2.4**	3.2	3.8	4.2	4.6	5.5	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	29	5.6	5.8	**1.9**	**2.5**	**3.0**	3.4	3.8	4.5	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	54	14	13	4.2	5.2	6.1	6.9	7.8	9.3	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	10	5.1	6.0	**2.0**	**2.6**	**3.0**	3.5	3.8	4.7	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	10	4.0	5.0	**1.6**	**2.2**	**2.6**	3.0	3.3	4.1	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	12	**3.0**	**3.9**	**1.3**	**1.7**	**2.0**	**2.3**	**2.6**	**3.2**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	14	4.7	5.4	**1.7**	**2.2**	**2.6**	**3.0**	3.3	4.0	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	20	**2.9**	**3.4**	**0.99**	**1.2**	**1.2**	**1.3**	**1.3**	**1.4**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	153	253	33	32	8.5	10	11	12	12	14	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**6.6**	5.1	7.2	**2.4**	3.2	3.8	4.5	5.0	6.1	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	11	5.6	7.4	**2.5**	3.4	4.1	4.7	5.2	6.1	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.9**	17	33	8.8	12	15	16	18	22	CMA+DE-MOS [13]
NEWUOA	**1**	15	**2.1**	**3.0**	**1.0**	**1.6**	**1.9**	**2.1**	**2.3**	**2.9**	NEWUOA [16]
Basic RCGA	**1**	**7.1**	28	63	28	46	121	229	288	377	Basic RCGA [17]
SPSA	104	177	4405	5820	2316	4151	5693	6382	7916	*34e-5/1e5*	SPSA [9]

Table 92: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{102} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	2.6	4.1	20	21	23	24	27	30	ERT_{best}/D
(1,2)-CMA-ES	**1**	50	15	15	4.4	5.2	5.7	6.4	6.8	7.9	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	25	7.3	7.7	**2.3**	**2.8**	3.1	3.6	3.7	4.1	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	23	4.9	6.3	**1.9**	**2.3**	**2.6**	**2.9**	3.1	3.5	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	26	22	21	5.8	6.6	7.4	8.2	8.6	12	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	21	5.8	6.4	**2.0**	**2.5**	**2.9**	3.2	3.4	3.8	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	7.7	4.6	5.1	**1.6**	**1.9**	**2.2**	**2.6**	**2.7**	3.1	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	14	**3.6**	**4.4**	**1.3**	**1.6**	**1.9**	**2.1**	**2.2**	**2.5**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	17	4.7	**4.9**	**1.6**	**2.0**	**2.2**	**2.5**	**2.7**	**3.0**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	31	**2.9**	**3.2**	**0.89**	**1.1**	**1.2**	**1.3**	**1.4**	**1.7**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	147	242	35	32	8.9	10	10	11	11	11	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	10	5.0	6.9	**2.2**	**2.8**	3.3	3.7	4.0	4.4	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**6.0**	5.3	7.2	**2.3**	**2.9**	3.3	3.8	4.0	4.4	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.9**	19	32	8.3	11	13	13	15	16	CMA+DE-MOS [13]
NEWUOA	**1**	18	**3.5**	7.9	8.0	30	48	81	146	547	NEWUOA [16]
Basic RCGA	**1**	**4.1**	26	57	26	42	102	193	234	285	Basic RCGA [17]
SPSA	124	183	1.56e5	3.44e5	*21e+0/1e5*	.	.	.	.	.	SPSA [9]

Table 93: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{103} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.10	0.10	2.6	4.7	13	14	36	36	36	36	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	34	14	12	6.4	7.4	3.6	4.3	5.2	6.8	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	27	6.8	6.4	3.3	4.0	**2.1**	**2.5**	**3.0**	3.8	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	16	6.1	6.0	3.0	3.5	**1.7**	**2.1**	**2.4**	3.1	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	26	12	11	5.5	6.3	3.1	3.8	4.7	6.1	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	16	5.8	5.7	**3.0**	3.6	**1.8**	**2.2**	**2.6**	3.5	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	13	4.7	4.6	**2.6**	**3.1**	**1.5**	**1.9**	**2.2**	**2.9**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	14	**3.5**	**3.4**	**1.9**	**2.2**	**1.1**	**1.4**	**1.6**	**2.1**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	17	4.8	4.4	**2.4**	**2.8**	**1.4**	**1.7**	**2.1**	**2.7**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	31	**3.0**	**2.9**	**1.8**	6.8	25	100	1518	*39e-6/8e3*	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	121	223	32	25	12	12	5.5	6.6	7.7	10	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**7.8**	4.9	6.0	3.5	4.2	**2.1**	**2.6**	3.1	4.0	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	11	5.0	6.0	3.4	4.2	**2.1**	**2.6**	3.1	4.0	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.9**	16	28	13	17	8.4	11	13	18	CMA+DE-MOS [13]
NEWUOA	**1**	15	**2.3**	**3.6**	5.2	29	95	243	1050	*15e-5/6e3*	NEWUOA [16]
Basic RCGA	**1**	**5.3**	33	55	43	74	83	157	201	253	Basic RCGA [17]
SPSA	105	725	112	109	57	88	1065	4244	*18e-5/1e5*	.	SPSA [9]

Table 94: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{104} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	9.4	30	61	999	1664	1842	1936	2015	2076	2201	ERT_{best}/D
(1,2)-CMA-ES	4.6	3.5	3.8	43	*24e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.4**	**2.7**	**2.1**	11	41	78	74	71	*72e-2/1e4*	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**2.0**	**2.0**	**1.5**	15	26	76	72	70	*16e-1/1e4*	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	7.1	4.9	3.2	26	*15e-1/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.8**	**2.5**	**2.1**	7.4	87	*56e-2/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.5**	**0.98**	**1.3**	32	41	77	73	70	68	64	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.1**	**1.8**	**1.2**	13	43	*92e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.6**	**1.8**	**1.4**	8.2	26	77	*40e-2/1e4*	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.51**	**0.78**	**0.74**	7.1	22	*67e-2/8e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	10	4.7	3.5	38	23	21	20	19	18	17	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.9**	**1.2**	**1.2**	**2.0**	**1.3**	**1.2**	**1.2**	**1.2**	**1.2**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.9**	**1.9**	**2.2**	**1.6**	**1.1**	**1.1**	**1.1**	**1.0**	**1.0**	**0.99**	IPOP-CMA-ES [15]
CMA+DE-MOS	6.3	4.4	3.9	**3.5**	**2.5**	**2.6**	**2.8**	**2.7**	**2.7**	**2.7**	CMA+DE-MOS [13]
NEWUOA	**0.51**	**1.6**	5.4	4.6	47	*55e-2/5e3*	.	.	.	.	NEWUOA [16]
Basic RCGA	8.1	11	74	*73e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	41	24	*70e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 95: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{105} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	9.0	33	95	2149	7015	7257	7422	7734	7819	7973	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	5.5	5.1	4.5	15	20	*21e-1/1e4*	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.7**	**1.9**	**1.7**	10	*19e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.9**	**2.7**	**1.8**	7.5	6.2	20	*14e-1/1e4*	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	5.5	6.0	5.6	32	21	*35e-1/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.0**	**1.9**	**1.3**	7.5	9.5	*15e-1/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.6**	**1.9**	**1.1**	12	10	*20e-1/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.2**	**1.9**	**1.4**	6.6	10	*59e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.6**	**1.6**	**1.1**	6.2	3.8	10	19	*38e-2/1e4*	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.64**	**1.7**	**2.5**	**5.1**	**3.7**	16	*88e-2/8e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	11	5.0	**2.5**	304	93	90	88	85	84	176	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.8**	**1.2**	**1.0**	**2.0**	**0.64**	**0.63**	**0.63**	**0.61**	**0.61**	**0.61**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.1**	**1.4**	**2.2**	**2.4**	**0.82**	**0.82**	**0.82**	**0.80**	**0.80**	**0.81**	IPOP-CMA-ES [15]
CMA+DE-MOS	7.5	3.9	**2.4**	13	3.9	**3.8**	**3.7**	**3.6**	**3.6**	**3.5**	CMA+DE-MOS [13]
NEWUOA	**0.35**	**1.2**	11	10	*52e-1/5e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	10	10	45	328	*61e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	29	20	*70e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 96: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{106} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	9.0	19	29	342	771	819	850	874	897	937	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	5.6	6.9	8.3	4.6	**2.5**	**2.6**	**2.6**	**2.6**	**2.6**	**2.6**	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.4**	**2.5**	3.2	**2.2**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**2.4**	3.2	3.2	**1.5**	**0.85**	**0.89**	**0.90**	**0.91**	**0.91**	**0.90**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	4.8	8.0	8.1	7.9	4.1	4.1	4.1	4.1	4.0	4.0	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.0**	**2.3**	**2.5**	**1.5**	**0.85**	**0.88**	**0.90**	**0.91**	**0.91**	**0.92**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.8**	**2.1**	**2.2**	**1.4**	**0.77**	**0.80**	**0.81**	**0.82**	**0.82**	**0.82**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.2**	**1.1**	**1.8**	**0.84**	**0.48**	**0.50**	**0.51**	**0.51**	**0.52**	**0.52**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.9**	**2.3**	**2.5**	**1.6**	**0.85**	**0.86**	**0.86**	**0.87**	**0.87**	**0.87**	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.56**	**0.67**	**1.3**	5.4	19	162	*13e-2/9e3*	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	9.2	6.6	6.6	3.0	**1.6**	**1.7**	**1.7**	**1.8**	**1.9**	**2.1**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.9**	**1.9**	**2.4**	**1.7**	**0.96**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.8**	**2.4**	**2.8**	**2.0**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES [15]
CMA+DE-MOS	7.3	6.9	7.9	3.3	**1.8**	**1.8**	**1.9**	**1.9**	**2.0**	**2.1**	CMA+DE-MOS [13]
NEWUOA	**0.38**	**0.86**	**1.6**	7.5	14	26	*11e-2/7e3*	.	.	.	NEWUOA [16]
Basic RCGA	7.5	15	138	463	443	888	*66e-1/5e4*	.	.	.	Basic RCGA [17]
SPSA	165	1194	22845	*16e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 97: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{107} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	95	225	387	521	735	960	1134	1430	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	512	199	*11e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	22	15	632	*35e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	53	22	646	*54e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	415	702	*14e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	127	36	*54e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	30	12	139	*21e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	170	10	*34e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	20	36	299	*54e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	32	227	*15e+0/7e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	113	194	**1.3**	**1.3**	**2.1**	**3.4**	**3.3**	**5.2**	**5.9**	17	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**6.1**	**0.97**	**1.1**	**1.4**	**1.3**	**1.1**	**0.89**	**0.96**	**0.94**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	10	**0.85**	**0.86**	**0.93**	**1.1**	**1.0**	**0.96**	**0.90**	**0.82**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.9**	16	64	45	36	30	24	21	17	CMA+DE-MOS [13]
NEWUOA	**1**	15	130	*23e+0/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**2.4**	3.3	3.4	**2.9**	3.4	4.7	5.7	6.3	**6.4**	Basic RCGA [17]
SPSA	82	145	14817	*28e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 98: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{108} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	1002	3143	4759	7751	10929	13571	17900	30809	ERT_{best}/D
(1,2)-CMA-ES	**1**	1016	*28e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	1587	*26e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	926	*29e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	758	*27e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	924	67	*18e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	965	149	*17e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	707	33	*16e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	896	*22e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	1432	*27e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	11234	22743	**4.5**	**3.5**	**4.3**	**4.4**	**4.6**	**4.9**	**7.5**	**12**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	376	**1.0**	**0.63**	**0.98**	**0.88**	**0.98**	**1.0**	**1.1**	**0.88**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**63**	**0.78**	**0.64**	**0.69**	**0.77**	**0.70**	**0.82**	**0.78**	**0.77**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.9**	46	479	*74e-1/1e5*	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	593	*28e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**5.1**	4.6	225	*21e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	3022	8166	5.7	22	*78e-2/1e5*	.	.	.	.	.	SPSA [9]

Table 99: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{109} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	2.8	29	50	82	116	146	179	242	ERT_{best}/D
(1,2)-CMA-ES	**1**	55	15	**2.5**	**2.8**	**2.3**	**2.2**	**2.2**	**2.3**	**2.5**	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	31	6.0	**1.2**	**1.1**	**1.1**	**0.98**	**1.0**	**1.0**	**1.1**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	28	5.8	**1.0**	**0.94**	**0.83**	**0.77**	**0.79**	**0.78**	**0.75**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	55	14	**2.6**	**2.4**	**1.9**	**1.8**	**1.8**	**2.0**	**2.1**	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	16	5.4	**1.1**	**1.1**	**1.0**	**1.1**	**1.1**	**1.1**	**1.2**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	13	**4.2**	**0.84**	**0.83**	**0.83**	**0.82**	**0.81**	**0.83**	**0.87**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	12	**3.4**	**0.69**	**0.66**	**0.55**	**0.52**	**0.52**	**0.52**	**0.53**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	19	4.4	**0.99**	**0.94**	**0.83**	**0.77**	**0.77**	**0.76**	**0.77**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	20	11	38	665	*31e-2/7e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	125	202	31	4.7	3.5	485	*49e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	10	4.5	**1.2**	**1.2**	**1.1**	**1.1**	**1.2**	**1.2**	**1.2**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**6.3**	**4.4**	**1.1**	**1.1**	**1.1**	**1.0**	**1.0**	**1.1**	**1.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.9**	16	4.6	4.8	4.5	4.9	5.0	5.3	5.6	CMA+DE-MOS [13]
NEWUOA	**1**	16	12	77	*57e-2/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**4.4**	28	10	12	23	47	48	46	41	Basic RCGA [17]
SPSA	101	733	495	368	13065	*36e-2/1e5*	.	.	.	.	SPSA [9]

Table 100: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{110} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	35	141	1122	3.32e6	7.03e6	1.64e7	∞	∞	∞	∞	ERT_{best}/D
(1,2)-CMA-ES	*50e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	41	159	*16e+1/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	123	1016	*44e+1/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	*65e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	36	229	*11e+1/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	8.0	29	*64e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	14	35	*79e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	50	472	*21e+1/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	623	*16e+2/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	14	12	5.7	*76e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.1**	**2.5**	**0.94**	*55e-1/1e6*	.	.	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.95**	**1.4**	**0.92**	*57e-1/1e6*	.	.	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	8.6	9.0	12	**0.47**	*74e-1/1e5*	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	101	*83e+1/4e3*	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**3.8**	**5.2**	**2.7**	*85e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	67	886	*10e+1/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 101: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{111} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	384	1951	8293	∞	∞	∞	∞	∞	∞	∞	ERT_{best}/D
(1,2)-CMA-ES	380	*68e+2/1e4*	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	371	*45e+2/1e4*	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	*76e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	*65e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	*46e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	121	*21e+2/1e4*	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	120	*43e+2/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	388	*46e+2/1e4*	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	263	*10e+3/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	11	5.3	**7.9**	*93e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.79**	**0.47**	**0.72**	*70e-1/9e5*	.	.	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.63**	**0.57**	**0.85**	*70e-1/1e6*	.	.	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	17	17	15	*89e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	*74e+2/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**0.93**	**0.57**	25	*10e+0/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	9.2	35	*87e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 102: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{112} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	10	39	88	1158	1611	1739	1824	1891	1946	2044	ERT_{best}/D
(1,2)-CMA-ES	5.2	**3.0**	**2.0**	6.3	5.8	5.9	7.3	7.3	8.4	9.4	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.0**	**1.4**	**1.4**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.6**	**1.1**	**1.8**	**0.83**	**0.78**	**0.81**	**0.82**	**0.82**	**0.81**	**0.81**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	3.6	**2.5**	10	8.6	9.4	13	15	15	14	24	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.6**	**1.5**	**1.5**	**2.1**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.8**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.4**	**1.0**	**1.1**	**1.3**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.0**	**0.92**	**0.81**	**0.56**	**0.50**	**0.51**	**0.51**	**0.51**	**0.51**	**0.51**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.6**	**1.2**	**0.87**	**1.1**	**0.99**	**0.98**	**0.99**	**0.99**	**0.98**	**0.98**	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.54**	**0.83**	10	98	71	*42e-1/8e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	9.0	3.3	**2.2**	*77e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.6**	**0.92**	**0.83**	**0.95**	**0.92**	**0.97**	**0.98**	**0.99**	**0.99**	**0.98**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.6**	**0.88**	**0.76**	**1.2**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	IPOP-CMA-ES [15]
CMA+DE-MOS	6.4	3.4	**2.8**	**1.9**	**1.9**	**2.4**	**3.0**	**3.0**	**3.0**	**3.0**	CMA+DE-MOS [13]
NEWUOA	**0.37**	**0.39**	27	*81e-1/5e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	7.8	9.2	52	646	*77e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	127	468	16041	*29e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 103: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{113} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	15	447	2763	10288	10882	10898	10898	10898	11235	ERT_{best}/D
(1,2)-CMA-ES	71	99	*37e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	10	17	29	*97e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	151	16	335	*16e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	10	203	*50e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.9**	18	70	*13e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	3.2	9.2	18	*77e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	30	13	11	*77e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	34	21	156	*19e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	4.9	59	*40e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	306	5.1	12	63	*11e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	8.6	**1.3**	**0.77**	**0.61**	**0.31**	**0.33**	**0.33**	**0.33**	**0.33**	**0.32**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	5.7	**3.1**	**1.1**	**0.71**	**0.66**	**0.65**	**0.66**	**0.66**	**0.66**	**0.64**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.6**	4.9	23	13	**5.9**	**5.6**	**5.6**	**5.6**	**5.6**	**5.4**	CMA+DE-MOS [13]
NEWUOA	32	47	*39e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**2.7**	**2.7**	**3.0**	**4.5**	21	*53e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	188	7.8	*32e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 104: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{114} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	31	3661	12781	33069	38641	39025	39025	39025	40649	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	515	382	*98e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	244	402	*97e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	247	294	*83e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	516	536	*11e+1/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	229	285	*82e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	270	91	*58e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	678	160	*79e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	398	375	*88e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	104	242	*82e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	28455	402	16	**56**	*41e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	136	**7.5**	**0.60**	**0.44**	**0.45**	**0.43**	**0.44**	**0.44**	**0.44**	**0.43**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**3.6**	**6.3**	**0.66**	**0.66**	**0.60**	**0.60**	**0.62**	**0.62**	**0.62**	**0.61**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.6**	38	*21e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	32	114	*88e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**3.1**	**10**	**4.0**	*57e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	11115	267	46	*14e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 105: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{115} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.10	3.8	40	290	859	1232	1260	1260	1260	1281	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	22	6.7	11	253	*23e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.8**	4.3	**2.5**	16	174	*69e-2/1e4*	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	11	3.1	**2.0**	14	*65e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	7.5	9.3	14	*27e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	4.1	**2.5**	3.1	15	173	*75e-2/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	4.5	**1.8**	**1.2**	15	78	*61e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.7**	**1.9**	**1.6**	**10**	**50**	*39e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	6.9	**2.5**	**2.7**	18	164	*69e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	7.0	**2.6**	4.2	386	*24e-1/7e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	185	13	3.9	953	*13e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	3.5	**1.9**	**0.91**	**1.3**	**1.5**	**1.5**	**1.4**	**1.4**	**1.4**	**1.5**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	3.5	**2.0**	**1.0**	**3.7**	**5.3**	**4.1**	**4.1**	**4.1**	**4.1**	**4.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.6**	8.1	3.4	53	93	**122**	**120**	**120**	**120**	**118**	CMA+DE-MOS [13]
NEWUOA	11	**2.4**	19	*41e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**2.6**	6.2	37	45	269	579	566	566	566	557	Basic RCGA [17]
SPSA	177	41	34	*31e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 106: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{116} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget ERT_{best}/D	1e+03 105	1e+02 1652	1e+01 7144	1e+00 10554	1e-01 10911	1e-02 11251	1e-03 11584	1e-04 11938	1e-05 12316	1e-07 16727	Δftarget ERT_{best}/D
(1,2)-CMA-ES	1414	*59e+2/1e4*	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	683	*24e+2/1e4*	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	*28e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	*55e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	131	*99e+1/1e4*	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	39	*36e+1/1e4*	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	122	*90e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	220	*13e+2/1e4*	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	974	*35e+2/7e3*	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	790	426	*70e+1/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.9**	**0.87**	**0.34**	**0.38**	**0.42**	**0.42**	**0.43**	**0.44**	**0.44**	**0.35**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**4.4**	**1.9**	**0.98**	**0.94**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	**0.84**	IPOP-CMA-ES [15]
CMA+DE-MOS	24	14	**6.2**	**5.3**	**5.1**	**5.0**	**4.9**	**4.8**	**4.6**	**3.4**	CMA+DE-MOS [13]
NEWUOA	*28e+2/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**6.6**	**12**	32	*23e+0/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	4342	*29e+2/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 107: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{117} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid Uniform

Δftarget ERT_{best}/D	1e+03 2241	1e+02 10129	1e+01 22785	1e+00 39931	1e-01 48902	1e-02 62584	1e-03 65419	1e-04 68653	1e-05 71653	1e-07 79447	Δftarget ERT_{best}/D
(1,2)-CMA-ES	*44e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	*55e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	*51e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	*76e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	*32e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	*33e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	*32e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	*39e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	*46e+2/7e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	114	*13e+2/1e5*	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.58**	**0.50**	**0.36**	**0.33**	**0.42**	**0.36**	**0.38**	**0.39**	**0.40**	**0.47**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.88**	**0.71**	**0.73**	**0.72**	**0.71**	**0.60**	**0.63**	**0.65**	**0.66**	**0.70**	IPOP-CMA-ES [15]
CMA+DE-MOS	20	50	**70**	*21e+1/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	27	*51e+2/4e3*	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.2**	**10**	*12e+1/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	662	*24e+2/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 108: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{118} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	11	31	135	324	434	530	610	651	707	806	ERT_{best}/D
(1,2)-CMA-ES	12	11	7.4	8.4	9.1	9.4	11	14	13	22	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	6.3	5.0	**2.9**	**2.7**	**2.4**	**2.2**	**2.0**	**2.0**	**1.9**	**1.8**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	5.1	4.2	**2.5**	**1.7**	**1.6**	**1.5**	**1.4**	**1.4**	**1.4**	**1.3**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	11	12	15	12	17	22	25	41	38	43	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	4.7	4.1	**2.4**	**2.0**	**1.9**	**1.9**	**1.8**	**2.0**	**1.9**	**1.9**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	3.9	**2.9**	**2.0**	**1.6**	**1.5**	**1.4**	**1.4**	**1.4**	**1.3**	**1.3**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**3.2**	**2.3**	**1.3**	**0.87**	**0.85**	**0.81**	**0.75**	**0.75**	**0.72**	**0.68**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	4.2	3.6	**2.1**	**1.5**	**1.3**	**1.2**	**1.2**	**1.2**	**1.2**	**1.1**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.0**	**3.2**	17	*37e-1/9e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	18	13	377	1238	3227	*60e-1/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	4.2	3.5	**1.4**	**0.89**	**0.89**	**0.88**	**0.87**	**0.88**	**0.88**	**0.88**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	4.8	5.2	**2.9**	**2.2**	**2.2**	**2.1**	**2.0**	**2.0**	**2.0**	**1.9**	IPOP-CMA-ES [15]
CMA+DE-MOS	12	8.6	3.4	**1.9**	**1.8**	**1.9**	**2.0**	**2.1**	**2.2**	**2.4**	CMA+DE-MOS [13]
NEWUOA	**1.2**	3.9	57	*99e-1/5e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	31	433	1202	*22e+0/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	26	133	11012	*29e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 109: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{119} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.10	0.10	13	312	497	1120	3654	17910	30139	39964	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	42	53	*38e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	7.6	16	143	*17e-1/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	20	15	457	*17e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	35	68	*45e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	5.3	24	222	*18e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	20	16	149	*14e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	12	15	47	*10e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	6.2	19	466	*21e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	25	195	*65e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	144	220	5.2	6.1	6.0	33	*32e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**5.1**	**3.5**	**1.2**	**1.5**	**1.3**	**0.67**	**0.31**	**0.27**	**0.28**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	5.3	**1.3**	**1.2**	**1.2**	**0.90**	**1.1**	**0.65**	**0.62**	**0.72**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**3.0**	64	62	69	32	**12**	**2.9**	**1.8**	**1.5**	CMA+DE-MOS [13]
NEWUOA	**1**	11	120	*60e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.9**	**3.3**	**3.0**	**3.2**	**2.7**	194	*22e-4/5e4*	.	.	Basic RCGA [17]
SPSA	80	117	8904	*10e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 110: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{120} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	47	3991	7463	15677	43945	93047	1.27e5	2.50e5	ERT_{best}/D
(1,2)-CMA-ES	**1**	307	893	*12e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	397	315	*11e+0/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	463	251	*97e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	704	275	*95e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**22**	108	*67e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	233	57	*57e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	168	57	*65e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	82	129	*69e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	439	157	*97e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	5333	13323	200	**10**	**13**	**7.6**	*34e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	112	**6.2**	**0.69**	**0.70**	**0.75**	**0.54**	**0.44**	**0.57**	**0.54**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	42	**6.6**	**0.60**	**0.57**	**0.74**	**0.64**	**0.60**	**0.63**	**0.55**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**3.0**	38	188	*44e-1/1e5*	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	179	152	*11e+0/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**2.3**	**6.6**	13	*80e-2/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	2288	9582	300	*55e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 111: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{121} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	7.2	32	63	148	368	694	999	1821	ERT_{best}/D
(1,2)-CMA-ES	**1**	20	5.8	3.3	3.0	**2.7**	**2.3**	**2.7**	4.0	80	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	10	**2.4**	**1.3**	**1.2**	**1.0**	**0.95**	**1.1**	**1.4**	**2.0**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	5.1	**1.7**	**0.92**	**0.93**	**0.71**	**0.66**	**0.70**	**0.89**	**1.3**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	17	4.5	**2.9**	**2.4**	**2.1**	**2.6**	4.1	5.8	81	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	9.1	**1.5**	**1.2**	**1.3**	**1.1**	**1.0**	**1.1**	**1.5**	**1.4**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	13	**1.3**	**0.91**	**0.93**	**0.85**	**0.77**	**0.83**	**1.0**	**1.1**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	10	**1.1**	**0.71**	**0.61**	**0.48**	**0.44**	**0.46**	**0.51**	**0.57**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	11	**1.1**	**1.00**	**0.90**	**0.75**	**0.65**	**0.61**	**0.74**	**0.81**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	15	**2.1**	153	1671	*76e-2/7e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	142	200	8.6	5.0	4.1	9513	*20e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	7.1	**1.4**	**1.0**	**1.1**	**0.94**	**0.78**	**0.70**	**0.72**	**0.69**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**4.3**	**1.2**	**1.1**	**1.2**	**1.0**	**1.2**	**1.5**	**1.7**	**2.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**3.0**	4.2	4.0	4.2	3.7	**2.9**	**2.5**	**2.6**	**2.3**	CMA+DE-MOS [13]
NEWUOA	**1**	7.9	3.4	215	*11e-1/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.9**	3.3	12	12	23	423	*22e-4/5e4*	.	.	Basic RCGA [17]
SPSA	100	206	236	20545	*46e-1/1e5*	.	.	.	.	.	SPSA [9]

Table 112: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{122} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	5.5	1156	3317	9790	14074	17571	43863	81680	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.1**	58	*41e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.6**	13	*28e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.8**	17	*27e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	17	53	*45e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	4.1	19	*33e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.2**	21	*26e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	4.1	12	*30e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**2.1**	22	*32e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	3.7	28	*42e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	118	217	11	**2.9**	*10e-1/2e3*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.5**	**1.5**	**0.85**	**0.87**	**0.50**	**0.61**	**0.74**	**0.50**	**0.72**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.6**	**0.61**	**0.89**	**0.63**	**0.67**	**0.63**	**0.58**	**0.80**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.4**	3.6	42	28	15	**13**	**10**	**4.9**	**3.2**	CMA+DE-MOS [13]
NEWUOA	**1**	**2.5**	45	*47e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.5**	**2.1**	**1.7**	**6.9**	**8.4**	15	*56e-3/5e4*	.	.	Basic RCGA [17]
SPSA	1.54e5	1.54e5	6624	*76e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 113: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{123} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	4.0	9439	38928	66490	1.29e5	1.99e5	3.33e5	1.03e6	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	1677	*82e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	85	591	*67e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.2**	674	*65e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	1094	*71e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	143	*56e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	32	215	*46e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1.3**	157	*52e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.1**	238	*61e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1.3**	181	*68e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	9772	12675	709	*63e-1/5e3*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**27**	**0.66**	**0.65**	**0.76**	**0.79**	**0.79**	**0.79**	**0.72**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**2.0**	**22**	**0.67**	**0.63**	**0.72**	**0.61**	**0.74**	**0.82**	**0.96**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.4**	202	*42e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	31	192	*64e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.3**	**3.7**	*23e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	1.14e6	1.15e6	3.51e5	*66e+2/1e5*	.	.	.	.	.	.	SPSA [9]

Table 114: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{124} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	3.7	61	1045	3430	5289	7378	13712	33136	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.3**	45	*45e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1.3**	4.8	192	*77e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1.1**	4.3	153	*85e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	361	*47e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	4.1	**2.7**	302	*12e-1/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1.6**	**2.3**	112	*65e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	3.1	**1.7**	74	*55e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	3.1	24	1113	*15e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	3.5	12	*24e-1/7e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	112	177	14	**3.5**	33	*13e-2/5e3*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.9**	**1.2**	**1.1**	**1.1**	**1.0**	**1.2**	**0.83**	**0.51**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	3.9	**1.8**	**1.2**	**1.5**	**1.1**	**1.2**	**1.1**	**1.2**	**1.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.4**	3.1	257	15	**7.2**	**5.4**	**4.6**	**3.0**	**1.6**	CMA+DE-MOS [13]
NEWUOA	**1**	5.0	11	*34e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.2**	3.5	13	**13**	11	14	*10e-4/5e4*	.	.	Basic RCGA [17]
SPSA	71512	71549	4897	*76e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 115: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{125} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget ERT_{best}/D	1e+03 0.10	1e+02 0.10	1e+01 0.10	1e+00 0.10	1e-01 0.10	1e-02 1.05e5	1e-03 2.97e5	1e-04 6.38e5	1e-05 6.40e5	1e-07 6.44e5	Δftarget ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1**	2738	*50e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	1214	*39e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	469	*41e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	4806	*54e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	947	*38e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	381	*37e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	500	*34e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	1304	*40e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	5.9	**39**	*19e-2/7e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	129	163	186	372	**2.30e5**	**3.2**	*14e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	115	**2.71e5**	**0.66**	**0.57**	**0.40**	**0.41**	**0.41**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	**94**	**2.69e5**	**0.82**	**0.70**	**0.43**	**0.43**	**0.44**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	426	3.25e5	15	*26e-3/1e5*	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	3.8	**84**	*22e-2/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	178	4.66e5	*88e-3/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	71510	71522	71531	71588	2.87e6	*12e-2/1e5*	.	.	.	.	SPSA [9]

Table 116: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{126} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.10	0.10	0.10	0.10	0.10	∞	∞	∞	∞	∞	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**1**	50600	*88e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	30608	*74e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	56376	*84e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	53386	*86e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	10553	*59e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	8849	*56e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**2.9**	8027	*57e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	9144	*72e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	9.4	49115	*89e-2/7e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	2497	3030	3915	13974	4.50e6	*12e-2/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	**304**	**3.12e6**	**1.92e7**	**6.27e7**	*80e-3/3e5*	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	558	**3.54e6**	*86e-3/3e5*	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	**485**	7.12e6	*17e-2/1e5*	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	29	11670	*66e-2/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	**147**	**1.11e6**	*12e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	1.40e7	*89e+2/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 117: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{127} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	0.10	0.10	0.10	79920	1.35e5	2.06e5	2.08e5	2.11e5	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1**	418	*30e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	137	4.77e5	*18e-2/1e4*	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	131	1.43e6	*22e-2/1e4*	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	534	*34e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	116	2.11e5	*15e-2/1e4*	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	78	1.59e5	*11e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	99	1.46e5	*12e-2/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	122	4.70e5	*15e-2/1e4*	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**1**	**40**	*20e-2/7e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	115	148	159	397	4.47e5	*72e-3/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	**78**	**75310**	**0.40**	**0.57**	**0.49**	**0.49**	**0.50**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	**66**	**1.08e5**	**0.63**	**0.80**	**0.62**	**0.63**	**0.64**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	273	**35137**	**1.0**	*66e-4/1e5*	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.4**	79	*25e-2/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.2**	206	2.25e5	*25e-3/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	112	144	652	1.34e5	1.41e7	*59e-2/1e5*	.	.	.	.	SPSA [9]

Table 118: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{128} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	915	13803	14050	14393	29169	29302	38266	52875	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	155	*15e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	8.5	4.9	**10**	*80e-1/1e4*	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	15	*78e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	77	*20e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	11	*81e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	3.7	**3.2**	*46e-1/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	6.5	**2.2**	*53e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	10	*82e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	32	*21e+0/7e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	124	170	**2.1**	6.9	**6.8**	**8.9**	**5.4**	**10**	**7.5**	13	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**0.65**	29	29	**28**	14	14	11	**7.7**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**0.47**	29	29	28	**14**	**14**	**11**	**7.7**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	52	51	51	106	52	52	40	29	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	*24e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	3.3	**4.9**	**5.1**	**5.1**	**2.6**	**4.0**	**3.1**	**4.1**	Basic RCGA [17]
SPSA	79	101	*64e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 119: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{129} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	5397	1.36e5	1.41e5	1.42e5	1.43e5	1.44e5	1.45e5	1.47e5	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	*44e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	*34e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	27	*32e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	28	*38e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	13	*21e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	*24e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	*23e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	*28e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	*39e+0/7e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	5487	16432	13	5.3	**10**	**10**	**10**	**10**	**10**	**10**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**0.69**	**2.5**	**4.0**	**4.0**	**3.9**	**3.9**	**3.9**	**4.9**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**0.63**	**5.0**	**4.9**	**4.9**	**4.9**	**4.9**	**4.9**	**4.9**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	25	*11e+0/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	*39e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**4.4**	**2.7**	*65e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	1935	9633	*41e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 120: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{130} in **10-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.10	0.10	48	588	3747	7052	7091	7151	7219	7334	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	12	40	8.1	4.3	4.3	4.3	4.3	4.2	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	10	6.4	**1.6**	**0.83**	**0.83**	**0.82**	**0.82**	**0.81**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	4.4	**2.4**	**0.84**	**0.45**	**0.45**	**0.45**	**0.44**	**0.44**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	11	8.0	**2.6**	**1.6**	**1.8**	**2.3**	3.3	3.3	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	5.1	5.9	**1.5**	**0.82**	**0.82**	**0.82**	**0.81**	**0.81**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	3.8	**5.5**	**1.3**	**0.68**	**0.68**	**0.68**	**0.68**	**0.67**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**2.9**	**2.3**	**0.77**	**0.41**	**0.41**	**0.41**	**0.41**	**0.40**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	5.0	5.7	**1.7**	**0.89**	**0.88**	**0.88**	**0.87**	**0.86**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**1.9**	6.0	8.6	*41e-2/7e3*	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	108	153	**2.5**	121	41	40	198	*15e-2/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**2.3**	309	49	26	26	25	25	25	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	3.6	582	126	67	67	66	66	65	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	324	378	81	43	43	42	42	41	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**2.6**	11	8.0	8.8	8.7	*14e-1/4e3*	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	53	55	11	5.8	6.1	6.2	9.3	23	Basic RCGA [17]
SPSA	121	152	1111	*73e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 121: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{101} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.05	0.28	3.0	21	29	34	35	36	37	39	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	107	17	3.4	3.3	3.5	4.0	4.5	5.0	5.8	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	51	9.1	**1.8**	**1.8**	**1.9**	**2.1**	**2.4**	**2.7**	3.1	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	45	7.4	**1.5**	**1.5**	**1.5**	**1.8**	**2.0**	**2.2**	**2.6**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	94	16	3.1	**2.9**	3.1	3.5	4.0	4.5	5.4	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	38	7.4	**1.5**	**1.5**	**1.6**	**1.9**	**2.2**	**2.5**	**2.9**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	29	5.9	**1.3**	**1.3**	**1.4**	**1.6**	**1.8**	**2.0**	**2.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	27	**5.0**	**1.0**	**0.99**	**1.0**	**1.2**	**1.4**	**1.5**	**1.9**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	32	6.0	**1.2**	**1.2**	**1.3**	**1.5**	**1.7**	**2.0**	**2.3**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	19	**3.3**	**0.98**	**0.85**	**0.88**	**0.94**	**1.0**	**1.0**	**1.1**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	319	144	40	7.5	6.4	6.0	6.3	6.7	7.0	7.7	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**15**	6.1	**1.5**	**1.6**	**1.7**	**2.1**	**2.4**	**2.7**	3.3	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**16**	6.0	**1.5**	**1.5**	**1.7**	**2.0**	**2.3**	**2.6**	3.2	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	44	29	6.0	5.2	6.2	7.7	8.1	8.9	11	CMA+DE-MOS [13]
NEWUOA	**1**	**8.9**	**3.1**	**0.85**	**0.90**	**0.97**	**1.1**	**1.2**	**1.5**	**1.6**	NEWUOA [16]
Basic RCGA	**1**	32	39	14	57	165	240	282	314	351	Basic RCGA [17]
SPSA	172	133	83636	*25e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 122: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{102} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.05	0.29	12	20	29	38	46	49	58	70	ERT_{best}/D
(1,2)-CMA-ES	**1**	109	5.0	4.1	3.7	3.7	4.1	5.0	5.3	10	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	54	**2.5**	**2.0**	**1.8**	**1.7**	**1.7**	**1.8**	**1.7**	**1.8**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	44	**1.9**	**1.6**	**1.4**	**1.4**	**1.3**	**1.5**	**1.5**	**1.5**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	143	6.0	4.7	4.4	5.5	7.4	13	18	50	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	34	**2.0**	**1.8**	**1.6**	**1.6**	**1.6**	**1.7**	**1.7**	**1.8**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	28	**1.5**	**1.4**	**1.3**	**1.3**	**1.3**	**1.4**	**1.4**	**1.4**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	19	**1.2**	**1.0**	**0.99**	**0.97**	**0.97**	**1.1**	**1.0**	**1.1**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	28	**1.5**	**1.3**	**1.3**	**1.3**	**1.3**	**1.4**	**1.4**	**1.6**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	19	**0.92**	**1.1**	**0.93**	**0.90**	**0.88**	**0.99**	**1.1**	**1.3**	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	291	131	10	7.7	6.1	5.3	4.8	4.9	4.5	4.3	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**11**	**1.5**	**1.6**	**1.6**	**1.5**	**1.6**	**1.7**	**1.7**	**1.8**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**15**	**1.6**	**1.6**	**1.6**	**1.5**	**1.6**	**1.8**	**1.7**	**1.8**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	47	9.0	6.3	5.1	5.6	5.8	5.8	5.7	6.1	CMA+DE-MOS [13]
NEWUOA	**1**	**10**	**2.9**	6.1	6.3	22	45	505	*31e-5/5e3*	.	NEWUOA [16]
Basic RCGA	**1**	30	11	15	56	152	178	203	200	195	Basic RCGA [17]
SPSA	218	212	*43e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 123: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{103} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.05	0.28	3.3	21	31	52	66	80	95	123	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	119	18	3.7	3.1	**2.3**	**2.2**	**2.1**	**2.1**	**2.0**	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	51	7.7	**1.7**	**1.6**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	39	6.4	**1.5**	**1.3**	**1.00**	**0.95**	**0.92**	**0.89**	**0.88**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	103	15	3.1	**2.7**	**2.1**	**2.1**	**2.0**	**2.0**	**1.9**	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	36	6.3	**1.5**	**1.4**	**1.0**	**1.1**	**1.0**	**1.0**	**1.0**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	28	5.1	**1.3**	**1.2**	**0.93**	**0.91**	**0.90**	**0.88**	**0.87**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	23	**4.3**	**0.99**	**0.92**	**0.70**	**0.67**	**0.66**	**0.65**	**0.63**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	32	5.2	**1.3**	**1.2**	**0.88**	**0.86**	**0.84**	**0.83**	**0.82**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	19	**3.0**	**0.95**	**2.0**	20	655	*14e-4/1e4*	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	305	146	36	7.4	5.6	3.8	3.3	3.1	3.1	**3.0**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**14**	5.4	**1.5**	**1.5**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**13**	5.5	**1.5**	**1.4**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	33	23	6.0	4.6	4.0	4.1	4.3	4.2	4.4	CMA+DE-MOS [13]
NEWUOA	**1**	**9.5**	**2.3**	**1.00**	5.9	44	1231	*48e-4/5e3*	.	.	NEWUOA [16]
Basic RCGA	**1**	26	32	13	72	230	212	195	179	151	Basic RCGA [17]
SPSA	352	615	125	31	30	34	84	17508	*37e-5/1e5*	.	SPSA [9]

Table 124: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{104} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	15	48	1185	4283	8566	8897	9124	9293	9472	9809	ERT_{best}/D
(1,2)-CMA-ES	4.2	6.0	63	*14e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.0**	**1.2**	28	34	*12e+0/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.7**	**2.3**	13	*12e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	3.7	5.0	119	*14e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.7**	**1.9**	17	*13e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.3**	**0.82**	12	*97e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.2**	**1.0**	10	35	17	*91e-1/1e4*	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.3**	**1.1**	21	*12e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.63**	**1.4**	11	*98e-1/1e4*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	7.1	3.1	**1.8**	**4.5**	**2.3**	**2.2**	**2.2**	**2.2**	**2.1**	**2.1**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.6**	**0.90**	**4.9**	**1.6**	**0.82**	**0.81**	**0.80**	**0.80**	**0.79**	**0.77**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.6**	**0.97**	**7.5**	**2.5**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.2**	IPOP-CMA-ES [15]
CMA+DE-MOS	7.1	**3.0**	35	10	4.9	4.7	4.6	4.6	4.5	4.3	CMA+DE-MOS [13]
NEWUOA	**0.35**	**1.5**	68	*17e+0/6e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	8.5	10	*18e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	25	*14e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 125: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{105} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate Uniform

Δftarget ERT_{best}/D	1e+03 15	1e+02 59	1e+01 9594	1e+00 30547	1e-01 31585	1e-02 32129	1e-03 32475	1e-04 32754	1e-05 33011	1e-07 33512	Δftarget ERT_{best}/D
(1,2)-CMA-ES	3.7	4.0	16	4.9	*17e+0/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.0**	**1.8**	**2.7**	*12e+0/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.6**	**1.9**	6.9	*13e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	4.9	6.7	16	*16e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.7**	**1.5**	7.4	*13e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.4**	**3.0**	6.9	*13e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.1**	**1.3**	**2.6**	*13e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.3**	**2.7**	4.9	*15e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.67**	**1.6**	7.2	*12e+0/1e4*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	6.4	**2.4**	70	*13e+0/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.5**	**1.5**	**1.2**	**0.43**	**0.43**	**0.44**	**0.44**	**0.44**	**0.44**	**0.44**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.4**	**2.6**	**1.9**	**0.76**	**0.76**	**0.77**	**0.77**	**0.77**	**0.77**	**0.76**	IPOP-CMA-ES [15]
CMA+DE-MOS	7.0	**2.2**	9.2	**2.9**	**2.9**	**2.8**	**2.8**	**2.8**	**2.7**	**2.7**	CMA+DE-MOS [13]
NEWUOA	**0.98**	7.2	*24e+0/5e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	8.8	10	*18e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	37	*14e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 126: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{106} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	14	29	574	1083	1187	1239	1274	1301	1325	1368	ERT_{best}/D
(1,2)-CMA-ES	4.3	5.4	**2.3**	3.9	3.9	4.1	4.1	4.1	4.1	4.1	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**2.1**	**1.7**	**0.88**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.8**	**1.7**	**0.71**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.1**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	3.9	3.6	**2.2**	3.9	3.9	3.9	3.9	3.8	3.8	3.8	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.7**	**2.8**	**0.97**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.6**	**1.8**	**0.64**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.1**	**1.3**	**0.55**	**0.59**	**0.61**	**0.62**	**0.62**	**0.62**	**0.62**	**0.62**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.5**	**1.7**	**0.68**	**0.89**	**0.91**	**0.91**	**0.91**	**0.91**	**0.91**	**0.91**	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.70**	**1.4**	8.1	*74e-1/1e4*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	7.4	5.0	**2.1**	**2.5**	**2.5**	**2.5**	**2.5**	**2.6**	**2.6**	14	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.6**	**1.5**	**0.77**	**0.76**	**0.84**	**0.88**	**0.89**	**0.90**	**0.91**	**0.91**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.7**	**1.5**	**1.0**	**1.4**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	7.8	5.2	**2.0**	9.0	8.7	8.4	8.3	8.2	8.1	8.0	CMA+DE-MOS [13]
NEWUOA	**0.44**	**0.87**	7.0	31	*49e-1/8e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	9.3	18	*17e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	133	1736	*52e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 127: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{107} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.05	8.8	429	679	811	1055	1368	2174	2624	3253	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	433	*83e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	151	*67e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	215	*61e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	998	*87e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	205	*67e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	123	*54e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	148	*56e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	259	*70e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	108	*64e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	327	**5.3**	**0.69**	**0.82**	**1.4**	**1.9**	**2.1**	**2.1**	**2.1**	**2.6**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	8.6	**0.81**	**0.97**	**1.3**	**1.4**	**1.5**	**1.4**	**1.3**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**4.3**	**1.1**	**0.95**	**1.1**	**1.1**	**0.96**	**0.72**	**0.68**	**0.65**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	25	109	160	140	109	87	55	46	37	CMA+DE-MOS [13]
NEWUOA	**1**	96	*57e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.3**	**1.7**	**1.9**	4.7	7.0	6.8	5.1	4.7	4.4	Basic RCGA [17]
SPSA	213	812	*65e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 128: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{108} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	19	2903	4861	10152	19820	22282	25366	31511	44879	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	685	*11e+1/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	804	*10e+1/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	594	*98e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	575	*94e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	694	*93e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	601	*96e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	660	*95e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	710	*10e+1/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	698	*11e+1/9e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	18344	114	**2.5**	**3.0**	**2.4**	**1.6**	**2.2**	**3.8**	**6.1**	*13e-6/1e5*	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**14**	**0.74**	**0.98**	**1.0**	**0.84**	**1.1**	**1.6**	**1.5**	**1.5**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	15	**0.72**	**0.87**	**0.66**	**0.57**	**0.77**	**0.89**	**0.94**	**1.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**4.5**	*43e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	259	*91e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**0.42**	*22e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	9320	90	11	*59e-1/1e5*	.	.	.	.	.	.	SPSA [9]

Table 129: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{109} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.28	17	32	57	84	114	150	179	248	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	107	3.6	3.5	**2.7**	**2.7**	**2.4**	**2.3**	**2.3**	**2.2**	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	56	**1.7**	**1.5**	**1.4**	**1.2**	**1.1**	**1.1**	**1.0**	**0.96**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	35	**1.3**	**1.2**	**0.97**	**0.90**	**0.84**	**0.77**	**0.77**	**0.72**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	107	3.4	**2.8**	**2.3**	**2.1**	**2.0**	**1.9**	**1.8**	**1.8**	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	34	**1.3**	**1.4**	**1.3**	**1.2**	**1.1**	**1.1**	**1.2**	**1.2**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	20	**1.1**	**1.1**	**1.0**	**0.96**	**0.95**	**0.91**	**0.91**	**0.88**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	25	**0.92**	**0.81**	**0.67**	**0.62**	**0.57**	**0.53**	**0.52**	**0.50**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	33	**1.1**	**1.0**	**0.89**	**0.79**	**0.73**	**0.68**	**0.70**	**0.68**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	19	17	*25e-1/9e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	325	141	7.1	5.4	3.7	16693	*19e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**12**	**1.1**	**1.2**	**1.2**	**1.1**	**1.2**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**15**	**1.1**	**1.2**	**1.1**	**1.1**	**1.1**	**1.0**	**1.0**	**1.00**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	50	6.2	4.1	4.3	4.3	4.2	4.1	4.1	4.0	CMA+DE-MOS [13]
NEWUOA	**1**	**10**	17	*33e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	34	7.4	10	117	127	111	97	87	70	Basic RCGA [17]
SPSA	311	551	54	2319	5124	*30e-2/1e5*	.	.	.	.	SPSA [9]

Table 130: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{110} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	185	1271	∞	∞	∞	∞	∞	∞	∞	∞	ERT_{best}/D
(1,2)-CMA-ES	*62e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	*72e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	*56e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	*65e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	*63e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	*35e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	*55e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	*53e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	*55e+3/9e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	**2.6**	**0.84**	*18e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.3**	**0.61**	*17e+0/1e6*	.	.	.	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.84**	**1.1**	*17e+0/1e6*	.	.	.	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	49	19	*19e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	*19e+3/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.4**	**0.63**	*20e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	149	*42e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 131: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{111} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	1022	4353	∞	∞	∞	∞	∞	∞	∞	∞	ERT_{best}/D
(1,2)-CMA-ES	*77e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	*84e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	*70e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	*77e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	*79e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	*71e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	*70e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	*63e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	*94e+3/9e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	**2.4**	**2.1**	*20e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.76**	**0.69**	*18e+0/9e5*	.	.	.	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.76**	**0.75**	*18e+0/9e5*	.	.	.	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	42	164	*28e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	*63e+3/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**0.73**	**1.9**	*49e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	30	*48e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 132: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{112} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	14	43	1278	3206	3481	3609	3678	3745	3807	3912	ERT_{best}/D
(1,2)-CMA-ES	3.9	5.0	3.1	8.4	20	20	40	39	39	38	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1.9**	**1.2**	**0.98**	**1.2**	**1.2**	**1.2**	**1.2**	**1.3**	**1.3**	**1.3**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1.7**	**2.3**	**0.60**	**0.68**	**0.71**	**0.72**	**0.73**	**0.73**	**0.73**	**0.73**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	4.2	4.0	3.8	11	43	*38e-1/1e4*	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1.7**	**2.5**	**1.4**	**1.6**	**2.1**	**2.3**	**2.3**	**2.3**	**2.3**	**2.3**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1.6**	**2.3**	**0.75**	**1.2**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1.0**	**0.95**	**0.35**	**0.48**	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1.3**	**2.8**	**0.59**	**0.63**	**0.69**	**0.71**	**0.72**	**0.72**	**0.73**	**0.74**	(1,4s)-CMA-ES [3]
avg NEWUOA	**0.58**	**3.0**	*20e+0/1e4*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	7.7	3.8	*18e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.4**	**1.2**	**0.84**	**0.84**	**0.89**	**0.92**	**0.93**	**0.94**	**0.94**	**0.93**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.6**	**1.9**	**0.95**	**0.94**	**1.0**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	7.3	3.1	**1.9**	3.8	3.8	4.0	4.0	4.0	3.9	3.9	CMA+DE-MOS [13]
NEWUOA	**0.46**	**2.6**	*29e+0/5e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	8.3	11	*18e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	74	1330	*53e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 133: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{113} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.59	90	2506	18176	28020	29382	29383	29383	29383	29554	ERT_{best}/D
(1,2)-CMA-ES	2007	*51e+1/1e4*	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	262	*26e+1/1e4*	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	561	*31e+1/1e4*	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	2018	*51e+1/1e4*	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	459	*25e+1/1e4*	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	221	532	*14e+1/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	103	*18e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	268	*29e+1/1e4*	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	434	*29e+1/9e3*	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	74	**2.2**	**1.6**	81	*21e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	15	**2.7**	**0.60**	**0.27**	**0.27**	**0.29**	**0.29**	**0.29**	**0.29**	**0.29**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**11**	**2.3**	**1.0**	**0.53**	**0.58**	**0.59**	**0.59**	**0.59**	**0.59**	**0.59**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.0**	8.5	27	**9.3**	**10**	**10**	**10**	**10**	**10**	**12**	CMA+DE-MOS [13]
NEWUOA	297	*24e+1/4e3*	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.9**	3.9	**0.77**	*23e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	58	1044	*98e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 134: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{114} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.59	1656	10409	55895	72257	78465	78525	78525	78525	79096	ERT_{best}/D
(1,2)-CMA-ES	2239	*67e+1/1e4*	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	2473	*55e+1/1e4*	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3076	*58e+1/1e4*	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	1875	*53e+1/1e4*	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	2210	*56e+1/1e4*	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	2064	*51e+1/1e4*	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	1088	*53e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	1208	*52e+1/1e4*	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	695	*44e+1/9e3*	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	6491	9.4	**13**	*74e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**70**	**0.84**	**0.64**	**0.35**	**0.53**	**0.62**	**0.62**	**0.62**	**0.62**	**0.63**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	160	**0.80**	**0.59**	**0.68**	**0.84**	**0.91**	**0.91**	**0.91**	**0.91**	**0.92**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.4**	107	*15e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	366	*47e+1/4e3*	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.7**	**8.0**	*46e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	5058	37	*71e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 135: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{115} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.53	17	120	1513	4587	6334	6340	6340	6340	6450	ERT_{best}/D
(1,2)-CMA-ES	26	5.8	1201	*16e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	15	**1.6**	7.0	*50e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	11	**1.3**	11	*52e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	30	5.7	*21e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	6.5	**1.3**	18	*61e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	6.3	**1.1**	5.9	*40e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	5.9	**0.88**	6.9	*45e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	7.5	**1.3**	26	*65e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	7.2	**0.89**	108	*93e-1/1e4*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	45	4.4	**1.1**	431	*14e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**3.2**	**1.1**	**1.4**	**1.2**	**0.54**	**0.45**	**0.45**	**0.45**	**0.45**	**0.45**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.9**	**0.94**	**1.1**	**4.8**	**2.2**	**1.8**	**1.8**	**1.8**	**1.8**	**1.9**	IPOP-CMA-ES [15]
CMA+DE-MOS	**2.9**	5.7	**1.3**	191	317	*17e-1/1e5*	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	3.3	**0.58**	236	*18e+0/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	4.1	4.8	14	**104**	**77**	*11e-1/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	45	10	966	*12e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 136: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{116} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget ERT_{best}/D	1e+03 1812	1e+02 9507	1e+01 24887	1e+00 34689	1e-01 44640	1e-02 50231	1e-03 51660	1e-04 52791	1e-05 54036	1e-07 56166	Δftarget ERT_{best}/D
(1,2)-CMA-ES	*29e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	*33e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	*34e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	*29e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	*27e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	*24e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	*23e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	*28e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	*20e+3/9e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	24	75	*26e+1/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.87**	**0.58**	**0.36**	**0.28**	**0.23**	**0.22**	**0.22**	**0.23**	**0.23**	**0.24**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.4**	**1.3**	**1.2**	**1.1**	**1.00**	**0.92**	**0.92**	**0.92**	**0.93**	**0.93**	IPOP-CMA-ES [15]
CMA+DE-MOS	13	**11**	**5.3**	**4.0**	**3.1**	**2.8**	**2.7**	**2.7**	**2.6**	**2.8**	CMA+DE-MOS [13]
NEWUOA	*22e+3/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1.9**	35	*22e+1/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	*11e+3/1e5*	.	.	.	.	.	.	.	.	.	SPSA [9]

Table 137: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{117} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	10122	35527	89270	1.23e5	1.30e5	1.38e5	1.45e5	1.54e5	1.62e5	1.81e5	ERT_{best}/D
(1,2)-CMA-ES	*30e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	*30e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	*30e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	*28e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	*29e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	*30e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	*32e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	*31e+3/1e4*	.	.	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	*24e+3/9e3*	.	.	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	*75e+2/1e5*	.	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.40**	**0.45**	**0.37**	**0.35**	**0.41**	**0.44**	**0.45**	**0.46**	**0.47**	**0.56**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.68**	**0.71**	**0.55**	**0.61**	**0.66**	**0.67**	**0.69**	**0.70**	**0.71**	**0.72**	IPOP-CMA-ES [15]
CMA+DE-MOS	147	*22e+2/1e5*	.	.	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	*26e+3/4e3*	.	.	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**11**	*14e+2/5e4*	.	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	*13e+3/1e5*	.	.	.	.	.	.	.	.	.	SPSA [9]

Table 138: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{118} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	26	184	345	589	876	1110	1317	1394	1503	1633	ERT_{best}/D
(1,2)-CMA-ES	6.5	3.2	4.6	10	20	42	55	105	98	*11e-2/1e4*	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	3.3	**1.4**	**1.7**	**1.7**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.4**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	3.1	**1.00**	**1.2**	**1.3**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.0**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	5.7	**3.0**	5.1	14	13	17	56	*13e-3/1e4*	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**2.9**	**1.1**	**1.8**	**1.9**	**2.1**	**2.1**	**1.9**	**2.0**	**2.0**	**2.0**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**2.3**	**0.89**	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.3**	**1.2**	**1.2**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**2.0**	**0.71**	**0.83**	**0.81**	**0.74**	**0.69**	**0.64**	**0.64**	**0.61**	**0.60**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**2.4**	**0.97**	**1.1**	**1.1**	**1.1**	**1.2**	**1.1**	**1.2**	**1.2**	**1.2**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1.3**	7.9	*43e+0/1e4*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	8.3	**2.5**	3.0	1105	*21e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.8**	**0.88**	**0.82**	**0.78**	**0.71**	**0.66**	**0.63**	**0.65**	**0.64**	**0.66**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	4.0	**1.8**	**2.0**	**1.8**	**1.7**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	6.1	**2.0**	**1.9**	**2.1**	**2.0**	**1.8**	**1.7**	**1.8**	**1.8**	**1.8**	CMA+DE-MOS [13]
NEWUOA	**1.2**	7.9	*62e+0/6e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	46	363	*10e+1/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	20	184	*63e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 139: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{119} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.05	0.05	139	1468	1796	3164	20535	47098	69961	95143	ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	2220	*21e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	319	517	*13e+0/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	413	508	*14e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	836	*20e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	518	*15e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	67	316	*13e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	208	*13e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	723	505	*15e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	304	*15e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	352	545	**1.3**	**1.3**	**1.5**	**3.9**	70	*19e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**18**	**1.6**	**0.62**	**0.83**	**0.92**	**0.42**	**0.29**	**0.25**	**0.28**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	31	**1.9**	**0.58**	**0.69**	**0.80**	**0.58**	**0.58**	**0.59**	**0.97**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.1**	9.5	22	28	21	**5.8**	**3.3**	**2.6**	**5.4**	CMA+DE-MOS [13]
NEWUOA	**1**	33	398	*18e+0/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**5.2**	**1.8**	**1.6**	**2.4**	6.9	*57e-4/5e4*	.	.	.	Basic RCGA [17]
SPSA	282	359	*19e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 140: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{120} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers Uniform

Δftarget ERT_{best}/D	1e+03 0.05	1e+02 0.05	1e+01 1802	1e+00 8940	1e-01 14054	1e-02 42575	1e-03 79607	1e-04 2.70e5	1e-05 3.37e5	1e-07 6.75e5	Δftarget ERT_{best}/D
(1,2)-CMA-ES	**1**	3441	*29e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	4298	*34e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	3333	*33e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	4780	*28e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	4498	*29e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	1819	*30e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	2797	*35e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	4040	*32e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	757	*29e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	12827	20132	**4.7**	**5.6**	**5.1**	**4.5**	*16e-3/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	369	**0.62**	**0.64**	**0.79**	**0.83**	**0.78**	**0.43**	**0.44**	**0.40**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**240**	**0.69**	**0.60**	**0.74**	**0.57**	**0.67**	**0.52**	**0.69**	**0.69**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.1**	45	*92e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	593	*30e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**3.5**	4.8	*61e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	10758	31179	231	*12e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 141: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{121} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.05	0.05	12	38	71	172	465	1099	1722	2870	ERT_{best}/D
(1,2)-CMA-ES	**1**	217	4.8	3.4	**3.0**	**2.3**	**1.9**	**1.8**	3.8	*35e-7/1e4*	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	163	**2.2**	**1.4**	**1.2**	**0.93**	**0.81**	**0.69**	**0.80**	6.2	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	133	**1.9**	**1.2**	**1.0**	**0.74**	**0.58**	**0.51**	**0.59**	5.3	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	215	4.5	**2.8**	**2.7**	**1.9**	**1.5**	**1.5**	3.8	*44e-7/1e4*	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	62	**1.8**	**1.5**	**1.4**	**1.1**	**0.87**	**0.79**	**1.0**	**2.1**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	26	**1.4**	**1.1**	**1.0**	**0.87**	**0.73**	**0.62**	**0.75**	**1.2**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	43	**1.1**	**0.80**	**0.71**	**0.52**	**0.41**	**0.35**	**0.39**	**0.53**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	24	**1.5**	**1.1**	**0.90**	**0.69**	**0.55**	**0.46**	**0.58**	**0.98**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	82	49	*40e-1/9e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	301	475	8.1	5.5	5.5	*46e-3/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	20	**1.2**	**1.0**	**1.1**	**0.98**	**0.77**	**0.58**	**0.56**	**0.64**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**18**	**1.3**	**1.1**	**1.1**	**1.1**	**1.1**	**1.2**	**1.4**	**1.9**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**5.1**	6.6	3.4	3.7	3.4	**2.5**	**2.3**	**2.2**	**2.2**	CMA+DE-MOS [13]
NEWUOA	**1**	29	31	*52e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**5.3**	5.0	10	36	76	*41e-4/5e4*	.	.	.	Basic RCGA [17]
SPSA	210	876	12355	*10e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 142: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{122} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.05	0.05	35	2600	6978	18826	39669	54172	99925	2.91e5	ERT_{best}/D
(1,2)-CMA-ES	**1**	25	99	*87e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	7.9	45	*67e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	6.0	29	*78e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	128	*88e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	9.2	78	*69e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	7.4	34	*68e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	8.5	44	*75e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	7.3	32	*77e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**2.3**	125	*77e-1/9e3*	.	.	.	.	.	.	avg NEWUOA [16]
IPOP-aCMA-ES	**1**	6.0	**2.3**	**0.81**	**0.97**	**0.66**	**0.56**	**0.65**	**0.66**	**0.81**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**2.0**	**2.0**	**0.92**	**0.74**	**0.55**	**0.63**	**0.67**	**0.95**	**0.64**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	4.9	84	72	*14e-1/1e5*	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	6.8	82	*80e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.1**	**1.6**	**6.7**	**7.7**	**6.0**	*98e-3/5e4*	.	.	.	Basic RCGA [17]
SPSA	1.00e6	1.00e6	5840	*11e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 143: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{123} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.05	0.05	53	26479	74388	1.63e5	2.64e5	4.89e5	1.36e6	7.92e6	ERT_{best}/D
(1,2)-CMA-ES	**1**	148	1303	*12e+0/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	*12e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	215	1341	*12e+0/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	245	627	*13e+0/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	103	651	*11e+0/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	275	*10e+0/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	113	490	*11e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	120	803	*12e+0/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	128	405	*11e+0/9e3*	.	.	.	.	.	.	avg NEWUOA [16]
IPOP-aCMA-ES	**1**	**1.3**	**6.4**	**0.72**	**0.88**	**0.73**	**0.94**	**0.86**	**0.50**	**1.9**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.7**	**7.2**	**0.72**	**0.61**	**0.69**	**0.80**	**0.71**	**0.62**	*28e-7/1e6*	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	71	*68e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	53	174	*10e+0/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.4**	**7.0**	*48e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	1.76e6	2.41e6	*20e+1/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 144: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{124} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.05	0.05	10	98	2042	3225	6346	14253	19427	39957	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1.3**	407	*86e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	6.7	3.7	*33e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	4.6	3.5	1524	*36e-1/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	33	707	*84e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1.2**	143	*46e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	7.0	**2.4**	*23e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	50	*40e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1.5**	22	*50e-1/1e4*	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	3.3	95	*59e-1/9e3*	.	.	.	.	.	.	avg NEWUOA [16]
IPOP-aCMA-ES	**1**	3.4	**1.1**	**3.9**	**1.0**	**1.0**	**0.91**	**0.71**	**0.76**	**0.62**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.1**	**0.99**	**0.75**	**0.98**	**0.98**	**0.66**	**0.84**	**0.78**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.1**	4.3	**2.5**	**0.45**	**1.4**	**2.1**	**1.6**	**1.6**	**1.9**	CMA+DE-MOS [13]
NEWUOA	**1**	10	91	*66e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1.2**	**2.3**	8.1	3.6	6.0	6.1	15	*39e-5/5e4*	.	Basic RCGA [17]
SPSA	1.00e6	1.00e6	31557	*13e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 145: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{125} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.05	0.05	0.05	0.05	0.05	6.24e5	1.25e6	3.12e6	4.01e6	4.03e6	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1**	9.05e5	*12e-1/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	1.46e5	*94e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	1.22e5	*96e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	*13e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	1.61e5	*95e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	81397	*88e-2/1e4*	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	81829	*95e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	2.36e5	*10e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	**1**	**493**	*45e-2/9e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	283	321	364	738	9.45e6	*23e-2/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	827	**3.85e6**	**0.47**	**1.1**	**0.81**	**1.7**	**1.7**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	957	7.10e6	**0.70**	**0.79**	**0.56**	**1.8**	**1.8**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	1527	6.76e6	*18e-2/1e5*	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	**1**	**414**	*49e-2/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	**322**	**2.34e6**	*33e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	1.00e6	1.00e6	1.00e6	1.00e6	**3.44e6**	*12e-2/1e5*	.	.	.	.	SPSA [9]

Table 146: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{126} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.05	0.05	0.05	0.05	0.05	∞	∞	∞	∞	∞	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1**	*15e-1/1e4*	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	*15e-1/1e4*	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	*15e-1/1e4*	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	*14e-1/1e4*	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	*14e-1/1e4*	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	*13e-1/1e4*	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	2.92e6	*13e-1/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	2.86e6	*13e-1/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	122	2.60e6	*16e-1/9e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	2514	3109	3338	13054	*33e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	6417	*30e-2/2e5*	.	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	**5759**	*28e-2/2e5*	.	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	**1527**	*39e-2/1e5*	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	4.2	1.32e5	*12e-1/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.1**	**335**	**4.18e6**	*32e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	2.80e7	2.80e7	2.80e7	2.80e7	*45e+3/1e5*	.	.	.	.	.	SPSA [9]

Table 147: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{127} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.05	0.05	0.05	0.05	0.05	79507	2.22e5	3.40e5	3.63e5	3.71e5	ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	**1**	7537	*70e-2/1e4*	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1**	595	*52e-2/1e4*	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**1**	843	*48e-2/1e4*	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1**	7404	*67e-2/1e4*	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1**	1139	*44e-2/1e4*	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1**	756	2.91e6	*39e-2/1e4*	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**1**	654	*23e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1**	1149	*53e-2/1e4*	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	7.7	**219**	*43e-2/9e3*	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	292	335	353	754	*28e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	**193**	**2.82e5**	**0.75**	**1.0**	**1.2**	**1.1**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	267	**9.58e5**	**1.0**	**0.81**	**0.89**	**0.84**	**0.85**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	1526	**2.24e5**	*44e-3/1e5*	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	3.7	**253**	*45e-2/4e3*	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1**	314	1.07e6	*59e-3/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	226	276	960	2.30e6	8.02e6	*10e-1/1e5*	.	.	.	.	SPSA [9]

Table 148: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{128} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget ERT$_{\text{best}}$/D	1e+03 0.05	1e+02 0.05	1e+01 7017	1e+00 6.69e5	1e-01 8.61e5	1e-02 8.61e5	1e-03 8.61e5	1e-04 8.62e5	1e-05 8.62e5	1e-07 8.62e5	Δftarget ERT$_{\text{best}}$/D
(1,2)-CMA-ES	**1**	**1**	*71e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	*65e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	*66e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	*70e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	*66e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	*64e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	*65e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	*68e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	*69e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	284	367	**1.8**	**0.12**	**0.12**	**0.12**	**0.12**	**0.16**	**0.16**	**0.17**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**0.51**	**0.72**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	12	**1.0**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	96	*50e+0/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	*70e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**4.7**	**0.10**	**0.10**	**0.10**	**0.10**	**0.13**	**0.13**	**0.14**	Basic RCGA [17]
SPSA	309	350	*73e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 149: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{129} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher Uniform

Δftarget ERT_{best}/D	1e+03 0.05	1e+02 0.05	1e+01 3.91e5	1e+00 2.07e6	1e-01 2.08e6	1e-02 2.08e6	1e-03 2.09e6	1e-04 2.10e6	1e-05 2.10e6	1e-07 2.12e6	Δftarget ERT_{best}/D
(1,2)-CMA-ES	**1**	**1**	*73e+0/1e4*	.	.	.	.	.	.	.	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	*74e+0/1e4*	.	.	.	.	.	.	.	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	*73e+0/1e4*	.	.	.	.	.	.	.	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	*72e+0/1e4*	.	.	.	.	.	.	.	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	*70e+0/1e4*	.	.	.	.	.	.	.	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	*72e+0/1e4*	.	.	.	.	.	.	.	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	*72e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	*72e+0/1e4*	.	.	.	.	.	.	.	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	*74e+0/9e3*	.	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	3132	3641	**0.43**	**0.35**	**0.35**	**0.71**	**0.71**	**0.71**	**0.70**	**0.70**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**0.16**	**0.27**	**0.46**	**0.46**	**0.46**	**0.46**	**0.46**	**0.46**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**0.29**	**0.30**	**0.77**	**0.77**	**0.77**	**0.77**	**0.77**	**0.77**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	*59e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	*73e+0/4e3*	.	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	**1.9**	*34e+0/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	2290	9084	*69e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 150: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{130} in **20-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.05	0.05	245	4657	12618	12648	12688	12729	12755	12860	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,2)-CMA-ES	**1**	**1**	**2.1**	**1.8**	**0.96**	**0.97**	**0.97**	**0.97**	**0.97**	**0.97**	(1,2)-CMA-ES [4, 2]
(1,2m)-CMA-ES	**1**	**1**	**1.0**	**0.61**	**0.61**	**0.61**	**0.61**	**0.61**	**0.61**	**0.61**	(1,2m)-CMA-ES [4]
(1,2ms)-CMA-ES	**1**	**1**	**0.95**	**0.62**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	(1,2ms)-CMA-ES [4]
(1,2s)-CMA-ES	**1**	**1**	**1.9**	3.2	3.4	3.4	3.4	3.4	3.3	3.3	(1,2s)-CMA-ES [2]
(1,4)-CMA-ES	**1**	**1**	**1.0**	**0.97**	**0.63**	**0.63**	**0.63**	**0.63**	**0.63**	**0.63**	(1,4)-CMA-ES [5, 3]
(1,4m)-CMA-ES	**1**	**1**	**1.8**	**0.83**	**0.59**	**0.59**	**0.59**	**0.59**	**0.59**	**0.59**	(1,4m)-CMA-ES [5]
(1,4ms)-CMA-ES	**1**	**1**	**0.83**	**0.37**	**0.31**	**0.31**	**0.31**	**0.31**	**0.31**	**0.31**	(1,4ms)-CMA-ES [1, 5]
(1,4s)-CMA-ES	**1**	**1**	**1.2**	**0.95**	**0.95**	**0.95**	**0.94**	**0.94**	**0.94**	**0.94**	(1,4s)-CMA-ES [3]
avg NEWUOA	**1**	**1**	6.6	*45e-1/9e3*	.	.	.	.	.	.	avg NEWUOA [16]
CMA-EGS (IPOP,r1)	295	351	30	15	12	16	*76e-2/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.5**	66	54	54	54	54	54	53	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	4.9	76	37	37	37	37	37	37	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	103	59	52	52	51	51	51	51	CMA+DE-MOS [13]
NEWUOA	**1**	**1**	9.1	*77e-1/4e3*	.	.	.	.	.	.	NEWUOA [16]
Basic RCGA	**1**	**1**	16	8.7	5.0	5.2	6.6	7.2	7.2	9.0	Basic RCGA [17]
SPSA	292	365	5718	*73e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 151: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{101} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

101 Sphere moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	6.5	15	23	31	39	48	56	64	81	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**1.7**	**1.2**	**1.1**	**1.0**	**1.0**	**0.98**	**0.97**	**0.96**	**0.94**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	736	15	12	10	7.8	6.7	5.9	5.4	5.0	4.5	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.4**	**1.5**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.5**	**1.6**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	6.0	7.1	5.3	4.4	4.2	5.0	4.7	4.4	4.4	CMA+DE-MOS [13]
Basic RCGA	**1**	4.1	10	97	270	307	305	298	285	253	Basic RCGA [17]
SPSA	536	48	*52e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 152: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{102} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

102 Sphere moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	8.4	21	32	44	55	66	77	89	113	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	**1.5**	**1.0**	**0.92**	**0.88**	**0.87**	**0.88**	**0.88**	**0.92**	**0.98**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	686	11	8.5	6.8	5.6	4.8	4.4	4.0	3.8	3.4	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	6.1	5.1	3.8	3.1	**3.0**	3.7	3.4	3.1	3.3	CMA+DE-MOS [13]
Basic RCGA	**1**	**3.0**	7.3	68	199	218	222	214	204	181	Basic RCGA [17]
SPSA	488	927	*78e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 153: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{103} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

103 Sphere moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	5.9	13	31	42	54	68	82	95	124	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**2.1**	**1.5**	**0.86**	**0.79**	**0.76**	**0.72**	**0.69**	**0.68**	**0.64**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	739	16	14	7.7	6.1	5.1	4.4	4.0	3.9	3.8	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.5**	**1.7**	**1.2**	**1.1**	**1.2**	**1.1**	**1.2**	**1.2**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.5**	**1.7**	**1.2**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	6.4	7.9	3.9	3.3	3.4	3.7	3.4	3.5	3.4	CMA+DE-MOS [13]
Basic RCGA	**1**	4.2	11	83	424	381	334	299	269	221	Basic RCGA [17]
SPSA	864	36	34	24	25	63	231	*52e-5/1e5*	.	.	SPSA [9]

Table 154: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{104} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

104 Rosenbrock moderate Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	19	243	77238	89865	91381	92161	92647	93045	93422	94099	ERT_{best}/D
(1,4ms)-CMA-ES	**1.1**	**0.51**	*32e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	6.4	**0.81**	*25e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.4**	**0.42**	**0.33**	**0.31**	**0.31**	**0.31**	**0.32**	**0.32**	**0.32**	**0.32**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.4**	**0.42**	**0.97**	**0.88**	**0.89**	**0.89**	**0.89**	**0.89**	**0.89**	**0.89**	IPOP-CMA-ES [15]
CMA+DE-MOS	5.7	30	*38e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	9.4	21	*38e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	24	*27e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 155: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{105} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

105 Rosenbrock moderate Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	24	166	1.40e5	1.48e5	1.51e5	1.52e5	1.53e5	1.54e5	1.55e5	1.57e5	ERT_{best}/D
(1,4ms)-CMA-ES	**0.88**	**1.9**	*40e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	5.2	**1.4**	*34e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.1**	**0.51**	**0.49**	**0.50**	**0.50**	**0.51**	**0.51**	**0.51**	**0.51**	**0.51**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.1**	**0.95**	**0.79**	**0.80**	**0.80**	**0.80**	**0.80**	**0.80**	**0.80**	**0.81**	IPOP-CMA-ES [15]
CMA+DE-MOS	4.4	**0.80**	*38e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	7.5	35	*38e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	23	*27e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 156: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{106} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

106 Rosenbrock moderate Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	17	48	1731	2271	2388	2452	2488	2518	2544	2596	ERT_{best}/D
(1,4ms)-CMA-ES	**1.2**	**1.1**	**0.54**	**0.65**	**0.66**	**0.65**	**0.66**	**0.66**	**0.66**	**0.66**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	6.6	4.0	12	24	23	23	27	49	82	110	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.5**	**1.4**	**0.81**	**0.94**	**0.97**	**0.98**	**0.99**	**1.00**	**1.00**	**1.00**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.4**	**1.00**	**1.1**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	**1.3**	IPOP-CMA-ES [15]
CMA+DE-MOS	6.2	3.0	3.9	4.5	4.7	4.8	4.9	5.0	5.0	5.0	CMA+DE-MOS [13]
Basic RCGA	11	112	*37e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	85	5844	*25e+1/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 157: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{107} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

107 Sphere Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.03	225	960	1444	1873	2170	2443	2724	3015	3617	ERT$_{\text{best}}$/D
(1,4ms)-CMA-ES	**1**	*24e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	738	**1.1**	**1.5**	**1.9**	**2.3**	**2.8**	**3.2**	**3.2**	**3.6**	**4.3**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**2.2**	**1.2**	**1.2**	**1.2**	**1.6**	**2.1**	**2.2**	**2.8**	**2.6**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.8**	**1.1**	**0.96**	**0.92**	**0.94**	**0.95**	**0.97**	**0.98**	**1.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	241	1545	1028	*57e+0/1e5*	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**2.3**	16	12	13	15	14	13	17	18	Basic RCGA [17]
SPSA	476	2924	*14e+1/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 158: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{108} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

108 Sphere Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	2343	5366	14044	23379	37376	45909	52525	70438	1.06e5	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	*25e+1/1e4*	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	29020	**2.0**	**2.8**	**2.4**	**2.9**	**3.2**	**16**	*78e-4/1e5*	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**0.91**	**1.2**	**1.3**	**1.2**	**1.1**	**1.6**	**2.0**	**1.8**	**1.6**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**0.71**	**0.88**	**0.76**	**0.76**	**0.67**	**0.76**	**0.87**	**0.83**	**0.87**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	286	*15e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	16	*92e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	27994	**2.0**	*20e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 159: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{109} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

109 Sphere Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	7.7	21	36	63	92	124	156	188	251	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**1.5**	**0.94**	**0.85**	**0.68**	**0.61**	**0.56**	**0.52**	**0.50**	**0.48**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	689	12	8.4	6.3	4.3	*38e-3/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.1**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.0**	**1.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	5.1	4.9	3.5	3.9	3.2	3.3	3.2	3.1	3.1	CMA+DE-MOS [13]
Basic RCGA	**1**	3.4	8.2	251	234	194	161	139	122	98	Basic RCGA [17]
SPSA	683	30	371	1563	22528	*82e-2/1e5*	.	.	.	.	SPSA [9]

Table 160: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{110} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

110 Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	388	4139	∞	∞	∞	∞	∞	∞	∞	∞	ERT_{best}/D
(1,4ms)-CMA-ES	*32e+4/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	299	98	*12e+2/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.3**	**0.53**	*37e+0/1e6*	.	.	.	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.4**	**0.54**	*37e+0/9e5*	.	.	.	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	152	179	*47e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**0.87**	**2.6**	*51e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	722	*17e+2/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 161: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{111} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

111 Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	2641	15539	∞	∞	∞	∞	∞	∞	∞	∞	ERT_{best}/D
(1,4ms)-CMA-ES	*29e+4/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	*97e+3/1e5*	.	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.86**	**0.79**	*38e+0/1e6*	.	.	.	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.86**	**0.66**	*38e+0/1e6*	.	.	.	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	*39e+3/1e5*	.	.	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**8.4**	*63e+1/5e4*	.	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	26	*77e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 162: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{112} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

112 Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	18	72	4454	6347	6669	6799	6887	6959	7031	7155	ERT_{best}/D
(1,4ms)-CMA-ES	**1.2**	**0.68**	**0.41**	**0.51**	**0.51**	**0.52**	**0.52**	**0.52**	**0.52**	**0.52**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	7.0	**2.7**	*38e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.3**	**0.84**	**0.92**	**1.0**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.3**	**0.60**	**1.00**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	5.7	**2.0**	**2.3**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	CMA+DE-MOS [13]
Basic RCGA	10	81	*37e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	61	1905	*10e+1/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 163: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{113} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

113 Step-ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	52	1434	10997	63545	67375	75001	75001	75001	75001	75144	ERT_{best}/D
(1,4ms)-CMA-ES	*17e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	**2.3**	**0.86**	4.4	*52e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**2.1**	**0.79**	**0.54**	**0.24**	**0.26**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**2.5**	**0.71**	**0.75**	**0.63**	**0.72**	**0.69**	**0.69**	**0.69**	**0.69**	**0.69**	IPOP-CMA-ES [15]
CMA+DE-MOS	7.7	169	*11e+1/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1.0**	**1.6**	**3.1**	*70e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	3.1	*21e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 164: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{114} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

114 Step-ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	165	7217	41989	1.64e5	2.51e5	2.88e5	2.88e5	2.88e5	2.88e5	2.92e5	ERT_{best}/D
(1,4ms)-CMA-ES	*16e+2/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	27	**3.1**	**34**	*25e+0/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**4.0**	**0.72**	**0.52**	**0.41**	**0.35**	**0.45**	**0.45**	**0.45**	**0.45**	**0.45**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**4.3**	**0.72**	**0.60**	**0.75**	**0.66**	**0.65**	**0.65**	**0.65**	**0.65**	**0.65**	IPOP-CMA-ES [15]
CMA+DE-MOS	167	*74e+1/1e5*	.	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1.2**	*32e+1/5e4*	.	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	26	*28e+1/1e5*	.	.	.	.	.	.	.	.	SPSA [9]

Table 165: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{115} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

115 Step-ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	4.1	27	514	4858	9316	10456	10456	10456	10456	10493	ERT_{best}/D
(1,4ms)-CMA-ES	**1.8**	**1.7**	*24e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	13	4.0	**0.41**	*30e-1/1e5*	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1.4**	**1.1**	**0.83**	**0.84**	**0.57**	**0.56**	**0.56**	**0.56**	**0.56**	**0.57**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.1**	**0.96**	**1.5**	**3.7**	**2.5**	**2.7**	**2.7**	**2.7**	**2.7**	**2.7**	IPOP-CMA-ES [15]
CMA+DE-MOS	5.2	4.0	49	*58e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**2.9**	6.3	21	*45e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	6.3	7.2	*21e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 166: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{116} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

116 Ellipsoid Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	13071	60167	1.04e5	1.08e5	1.13e5	1.17e5	1.21e5	1.25e5	1.28e5	1.36e5	ERT_{best}/D
(1,4ms)-CMA-ES	*13e+4/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	*12e+4/1e5*	.	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.39**	**0.26**	**0.22**	**0.25**	**0.25**	**0.26**	**0.27**	**0.28**	**0.28**	**0.29**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.97**	**0.68**	**0.77**	**0.88**	**0.91**	**1.0**	**1.1**	**1.1**	**1.1**	**1.1**	IPOP-CMA-ES [15]
CMA+DE-MOS	*47e+2/1e5*	.	.	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**2.0**	*70e+1/5e4*	.	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	*40e+3/1e5*	.	.	.	.	.	.	.	.	.	SPSA [9]

Table 167: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{117} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

117 Ellipsoid Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	31303	1.35e5	2.11e5	2.97e5	3.40e5	3.65e5	4.33e5	4.57e5	4.79e5	5.28e5	ERT_{best}/D
(1,4ms)-CMA-ES	*12e+4/1e4*	.	.	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	*31e+3/1e5*	.	.	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.38**	**0.32**	**0.31**	**0.31**	**0.37**	**0.38**	**0.35**	**0.36**	**0.38**	**0.52**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.72**	**0.54**	**0.66**	**0.74**	**0.72**	**0.81**	**0.76**	**0.78**	**0.80**	**0.81**	IPOP-CMA-ES [15]
CMA+DE-MOS	*47e+3/1e5*	.	.	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	*95e+2/5e4*	.	.	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	*42e+3/1e5*	.	.	.	.	.	.	.	.	.	SPSA [9]

Table 168: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{118} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

118 Ellipsoid Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	139	363	980	1197	2046	2406	2717	2918	3113	3289	ERT_{best}/D
(1,4ms)-CMA-ES	**0.50**	**0.50**	**0.37**	**0.51**	**0.41**	**0.45**	**0.50**	**0.53**	**0.55**	**0.57**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	**2.3**	**1.9**	**1.1**	546	*20e-1/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**0.78**	**0.71**	**0.50**	**0.67**	**0.53**	**0.54**	**0.57**	**0.58**	**0.60**	**0.63**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**0.94**	**1.2**	**1.0**	**1.4**	**1.1**	**1.1**	**1.2**	**1.3**	**1.3**	**1.4**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.7**	**1.7**	**1.4**	**1.8**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	**1.6**	CMA+DE-MOS [13]
Basic RCGA	76	*30e+1/5e4*	.	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	7.5	3935	*18e+1/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 169: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{119} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

119 Sum of diff powers Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	1.3	1060	3076	3928	13306	53029	1.18e5	2.51e5	3.20e5	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	260	*50e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	1209	34	**1.3**	**4.6**	**4.1**	**2.6**	*27e-4/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	4.3	**3.8**	**0.79**	**0.71**	**0.95**	**0.68**	**0.53**	**0.35**	**0.19**	**0.21**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1.3**	**6.6**	**0.65**	**0.65**	**0.66**	**0.52**	**0.83**	**0.88**	**0.87**	**0.91**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.1**	10	113	482	378	*88e-1/1e5*	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**1.9**	4.0	18	19	54	*25e-2/5e4*	.	.	.	Basic RCGA [17]
SPSA	437	14	*34e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 170: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{120} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

120 Sum of diff powers Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	1.0	4090	17701	43288	84093	2.84e5	6.09e5	1.08e6	5.96e6	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	4473	*81e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	17083	1524	**6.7**	**13**	**8.4**	*24e-1/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	122	**0.81**	**1.00**	**1.3**	**1.2**	**0.64**	**0.47**	**0.30**	**0.22**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**102**	**0.83**	**0.72**	**0.72**	**0.83**	**0.83**	**0.76**	**0.79**	**2.5**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.1**	**19**	*28e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**3.0**	*19e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	34780	1644	*23e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 171: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{121} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

121 Sum of diff powers Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	1.4	18	43	84	205	689	1429	2435	5045	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	5.7	**1.2**	**0.86**	**0.67**	**0.50**	**0.32**	**0.32**	**0.35**	**0.50**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	673	20	10	9.3	612	*89e-3/1e5*	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1.8**	**1.2**	**1.1**	**1.1**	**0.94**	**0.68**	**0.63**	**0.59**	**0.60**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1.7**	**1.2**	**1.1**	**1.1**	**1.1**	**1.00**	**1.3**	**1.6**	**2.0**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1.1**	**2.3**	5.2	**2.9**	3.2	**2.9**	**2.2**	**2.2**	**2.2**	**2.1**	CMA+DE-MOS [13]
Basic RCGA	**1**	**1.5**	5.9	21	112	82	*38e-4/5e4*	.	.	.	Basic RCGA [17]
SPSA	517	65	35833	*18e+0/1e5*	.	.	.	.	.	.	SPSA [9]

Table 172: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{122} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

122 Schaffer F7 Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	0.03	123	6832	16079	26832	70248	1.12e5	3.02e5	8.23e5	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	13	1135	*12e+0/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
IPOP-aCMA-ES	**1**	**1**	**3.5**	**0.67**	**0.83**	**1.2**	**0.77**	**0.66**	**0.45**	**0.71**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	6.4	**3.1**	**0.78**	**0.77**	**0.90**	**0.53**	**0.63**	**0.50**	**0.84**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.3**	14	*64e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**1.5**	**1.1**	**49**	*30e-1/5e4*	.	.	.	.	.	Basic RCGA [17]
SPSA	6.00e6	6.01e6	11348	*68e+3/1e5*	.	.	.	.	.	.	SPSA [9]

Table 173: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{123} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

123 Schaffer F7 Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	0.03	331	59218	2.36e5	3.88e5	5.98e5	9.40e5	5.67e6	1.83e7	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**1**	*17e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
IPOP-aCMA-ES	**1**	**1**	**3.4**	**0.88**	**0.78**	**1.1**	**2.9**	**7.8**	*12e-4/1e6*	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	14	**2.8**	**0.90**	**0.93**	**0.97**	**0.86**	**1.3**	*25e-6/1e6*	.	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.3**	246	*97e-1/1e5*	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**1.2**	**2.7**	*75e-1/5e4*	.	.	.	.	.	.	Basic RCGA [17]
SPSA	1.60e7	1.60e7	*10e+4/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 174: Running time excess ERT/ERT$_{\text{best 2009}}$ on f_{124} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

124 Schaffer F7 Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT$_{\text{best}}$/D	0.03	0.03	14	754	5312	6585	9160	20490	28640	55992	ERT$_{\text{best}}$/D
(1,4ms)-CMA-ES	**1**	18	30	*58e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
IPOP-aCMA-ES	**1**	**3.0**	**1.1**	4.3	**1.8**	**1.8**	**1.5**	**0.94**	**0.86**	**0.64**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	3.3	**0.97**	**0.83**	**0.53**	**0.72**	**0.81**	**0.50**	**0.63**	**0.73**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1.3**	6.2	**2.0**	**0.68**	**0.92**	**1.1**	**0.84**	**0.90**	**0.83**	CMA+DE-MOS [13]
Basic RCGA	**1**	**1.3**	**1.6**	**1.5**	**2.4**	3.3	4.9	11	*21e-5/5e4*	.	Basic RCGA [17]
SPSA	1.60e7	1.60e7	*94e+3/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 175: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{125} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

125 Griewank-Rosenbrock Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	0.03	0.03	115	2.64e6	2.74e6	1.36e7	∞	∞	∞	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**1**	**1**	*16e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	717	916	1032	**0.36**	*45e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	**2.9**	**0.21**	**0.40**	**0.40**	*95e-4/1e6*	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	3.2	**0.55**	**0.75**	*48e-2/3e5*	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	**0.66**	*51e-2/1e5*	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**1**	**1.1**	**0.10**	**0.08**	*52e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	*11e+4/1e5*	.	.	.	.	.	.	.	.	.	SPSA [9]

Table 176: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{126} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

126 Griewank-Rosenbrock Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	0.03	0.03	218	∞	∞	∞	∞	∞	∞	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**1**	**1**	*17e-1/1e4*	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	3014	3562	3755	**1.3**	*52e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	3.8	*51e-2/2e5*	.	.	.	.	.	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	3.3	*50e-2/2e5*	.	.	.	.	.	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	**0.35**	*54e-2/1e5*	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**1**	**1.1**	**0.06**	**1.36e7**	*55e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	2.60e7	2.60e7	2.60e7	2979	*93e+3/1e5*	.	.	.	.	.	SPSA [9]

Table 177: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{127} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

127 Griewank-Rosenbrock Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	0.03	0.03	18	44721	2.63e5	3.78e5	6.24e5	6.49e5	6.66e5	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**1**	**1**	10	*78e-2/1e4*	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	711	818	968	**2.3**	*47e-2/1e5*	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1**	**1.0**	**1.1**	**0.39**	**0.89**	**0.93**	**0.95**	**0.94**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1**	**1.1**	3.6	**0.92**	**0.73**	**0.59**	**0.75**	**0.81**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	**1.1**	4.3	**2.6**	*10e-2/1e5*	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**1**	**1**	**0.57**	**3.1**	*16e-2/5e4*	.	.	.	.	Basic RCGA [17]
SPSA	431	527	4104	6726	31	*19e-1/1e5*	.	.	.	.	SPSA [9]

Table 178: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{128} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

128 Gallagher Gauss

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	0.03	1.03e5	9.57e5	2.82e6	2.82e6	2.82e6	2.82e6	2.82e6	2.82e6	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**1**	*81e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	673	930	**1.1**	**0.45**	**0.15**	**0.16**	**0.16**	**0.16**	**0.16**	**0.16**	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**0.16**	**0.62**	**0.59**	**0.59**	**0.59**	**0.59**	**0.59**	**0.59**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**0.75**	**1.3**	**0.82**	**0.82**	**0.82**	**0.82**	**0.82**	**0.82**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	*77e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**1**	*69e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	560	629	*80e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 179: Running time excess ERT/$\text{ERT}_{\text{best 2009}}$ on f_{129} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

129 Gallagher Uniform

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
ERT_{best}/D	0.03	0.03	8.67e5	9.40e5	2.54e6	2.55e6	2.56e6	2.58e6	2.59e6	2.62e6	ERT_{best}/D
(1,4ms)-CMA-ES	**1**	**1**	*82e+0/1e4*	.	.	.	.	.	.	.	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	1358	1503	*69e+0/1e5*	.	.	.	.	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**0.61**	**1.3**	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**0.38**	**0.82**	**0.62**	**0.62**	**0.62**	**0.62**	**0.63**	**0.63**	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	*76e+0/1e5*	.	.	.	.	.	.	.	CMA+DE-MOS [13]
Basic RCGA	**1**	**1**	*69e+0/5e4*	.	.	.	.	.	.	.	Basic RCGA [17]
SPSA	3993	8599	*78e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

Table 180: Running time excess ERT/$\mathrm{ERT}_{\mathrm{best\ 2009}}$ on f_{130} in **40-D**, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

130 Gallagher Cauchy

Δftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δftarget
$\mathrm{ERT}_{\mathrm{best}}$/D	0.03	0.03	317	6925	42118	42165	42224	42282	42361	42474	$\mathrm{ERT}_{\mathrm{best}}$/D
(1,4ms)-CMA-ES	**1**	**1**	**0.52**	**0.41**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	(1,4ms)-CMA-ES [1, 5]
CMA-EGS (IPOP,r1)	658	840	25	40	**6.6**	**6.7**	*20e-1/1e5*	.	.	.	CMA-EGS (IPOP,r1) [8]
IPOP-aCMA-ES	**1**	**1**	**1.1**	47	23	23	23	23	23	23	IPOP-aCMA-ES [12]
IPOP-CMA-ES	**1**	**1**	**1.8**	83	57	57	57	57	57	57	IPOP-CMA-ES [15]
CMA+DE-MOS	**1**	**1**	49	**40**	10	10	**9.5**	**9.5**	**9.5**	**9.4**	CMA+DE-MOS [13]
Basic RCGA	**1**	**1**	29	**9.4**	**2.6**	**2.9**	**2.9**	**3.0**	**3.0**	**3.0**	Basic RCGA [17]
SPSA	606	755	*84e+0/1e5*	.	.	.	.	.	.	.	SPSA [9]

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